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AT THE HEAD OF THE WORLD'S EXPORTERS.

The United States continues at the head of the list of the world's exporting nations. The comparative figures prepared each month by the treasury bureau of statistics, exhibiting the imports and exports of each of the principal countries of the world and the average per month during a given period, show that the domestic exports from the United States are greater than those for any other country, and that the monthly average during the year 1901 has been higher than that of any other country. For the nine months ending with September, our exports of domestic products were $1,024,605,181, against $1,018,845,768 from the United Kingdom, the next largest exporter of domestic products, in the same period. While a comparison during the same period with Germany, France, Russia, Netherlands, and India, which follow in the order named in the magnitude of their exports, is impracticable because their fiscal years are not conterminous with that of the United States, the totals of their exports during the latest available years show not only that the United States is clearly in the lead as an exporter, but that the growth in her exports has been more rapid than that of any other great exporting nation. In the calendar year 1900, for which the statistics of most exporting countries are now available, the figures for the United States were $1,453,013,659 of exports of domestic products, against $497,263,737 in 1875, an increase of nearly 200 per cent. during that period; while those of Germany were in 1900, $1,050,611,000, and in 1875 $607,096,000, an increase of 78 per cent.; and those of the United Kingdom, in 1900, $1,418,348,000, and in 1875, $1,087,497,000, an increase of about 40 per cent.

The very latest available data for comparing the commerce of the United States with that of other countries, however, are furnished in a statement just prepared by the treasury bureau of statistics, which shows the monthly exports of domestic merchandise from each of the principal countries of the world during that period of its fiscal year for which statistics are available. This shows that the monthly average for the United States is greater than that of any other country, and that the figures of 1901 show in the case of the United States a material increase over those of 1900, while those of the United Kingdom and Germany show a decrease. The average monthly exportation of domestic merchandise from the United States in the nine months ending with September, 1901, was $113,935,020, against $112,529,440 in the corresponding months of last year, an increase of about $1,500,000 per month, while those of the United Kingdom were in the same months of 1901 $113,205,085, against $118,132,533 in the same months of 1900, showing a decrease of about $5,000,000 per month; and those of Germany were $87,831,833 per month for the six months ending with June, 1901, against $88,520,833 for the corresponding months of the preceding year, showing a decrease of a little less than $1,000,000 per month.

The table which follows shows the average monthly exportation of domestic merchandise from the twenty principal exporting countries of the world for such portions of the fiscal year as the statistics are available, and compares the monthly figures of 1901 with those of 1900:

Average monthly exp rt f om	1900.	1901.
United States	$112,529,440	$113,935,020
United Kingdom	118,132,533	113,205,085
Germany	88,520,833	87,831,833
France	64,299,143	66,447,000
Netherlands	53,018,558	56,790,923
India	26,382,142	31,233,845
Austria-Hungary	31,573,017	30,290,724
Belgium	28,710,857	27,994,285
Russia, European	22,608,600	26,036,200
Italy	21,124,529	21,943,518
Argentina	15,134,280	15,725,763
Brazil	.....	15,051,841
Switzerland	13,081,105	13,127,100
Canada	11,556,416	11,752,925
Spain	11,604,120	9,873,671
China	11,763,405	9,554,055
Japan	7,430,732	9,366,891
Mexico	5,992,273	6,239,474
Egypt	6,813,842	6,069,856
Chile	4,961,670	5,100,104

RETVIZAN MAKES OVER 18 KNOTS.

The Russian battleship Retvizan, built by the Cramps, Philadelphia, was given her builders' trial last week. For twelve consecutive hours she was driven through storm and darkness, the trial being at night, at an average speed of 18.8 knots—faster time than has been made for that number of hours by any American-built battleship. The fastest of this class in the American navy is the Illinois, whose record is 17.31 knots. Although the speed of the Retvizan was taken officially for only 12 hours, the speed actually was maintained for 17 hours. Mr. Edwin S. Cramp said:

"The Russians were delighted with the results of the trip. The speed sustained by the vessel they regard as marvelous. The ship was required to make 18 knots for 12 hours and she has gone away above the speed for 5 hours more than was required. The Russians are so gratified that they are willing to consider her showing on the trip as her official speed trial. We had a rough, stormy night with a heavy sea. The wind was aft and the vessel was covered with spray all the time so that all hatches had to be battened down. To the Russians the midnight trial was a decided novelty."

The second submarine boat, launched by Vickers' Sons & Maxim, Barrow, England, was tested this week. Six men were in the boat for twelve hours and the air remained fresh.

LAKE SHIPPING—FREIGHT OUTLOOK.

Vessel owners of the great lakes realize that with new ships of more than 3,000,000 tons season capacity coming from the ship yards next spring their chances in the matter of freights for another year, to which they are now giving some thought, should not be altogether encouraging, especially in view of the fact that delays at ore and coal docks this season represent a reduction in the capacity of the present fleet of ships of fully a fifth, if compared with the ordinary despatch of previous years. But a material advance in freights within the past week, notwithstanding a light grain movement and the failure of railroads in Ohio and Pennsylvania to provide anything like the number of cars required for the lake trade, is decidedly encouraging to the ship interests, and reports from iron and steel manufacturers give them still further cause for viewing the future in a favorable light, even with the surplus tonnage question in mind. A very heavy business in practically all branches of the steel industry is assured for the first half of 1902, and it is now the general belief that the entire year will be one of decided prosperity. A single item of business supporting this view of the future in iron and steel is the tonnage in steel rails already under order for next year, which is said to be sufficient to keep all the mills employed until about September next.

A few days ago the ore shippers of Cleveland, noting a much lighter grain movement than was expected from the northwest, tried to make up an agreement whereby lake freights for the balance of the season would be held to a basis of about 90 cents from the head of Lake Superior. It was claimed that the amount of "wild" ore to be moved in the balance of the season was less than 400,000 tons and that freights on such an amount could readily be controlled. However this may be, the effort to make up a pool failed, as one house, wanting to play safe, managed to avoid the agreement, and while the shippers' negotiations were under way stepped into the market and took vessels at $1 from the head of the lakes and 70 cents from Escanaba, which rates have since been quite generally paid. The story of car shortage and congestion of ships at Lake Erie ports, to which these advanced rates, and, in fact, all advances of the present season are entirely due, is so familiar as to lose its force, but the present situation on that score is certainly without parallel in the history of coal and ore shipments on the lakes. Unless there is a decided change in the car supply before the close of navigation, the shortage of soft coal at both Lake Superior and Lake Michigan ports will be very great, and Lake Michigan ports are certain to show a shortage anyhow.

SENATOR HANNA ON THE SHIPPING BILL.

In the speech in which he opened the Ohio Republican campaign in Springfield last Monday evening, Senator M. A. Hanna touched upon the necessity of assisting the merchant marine of the United States to regain the prestige which it had before the civil war swept it away. Leading up to it, he said:

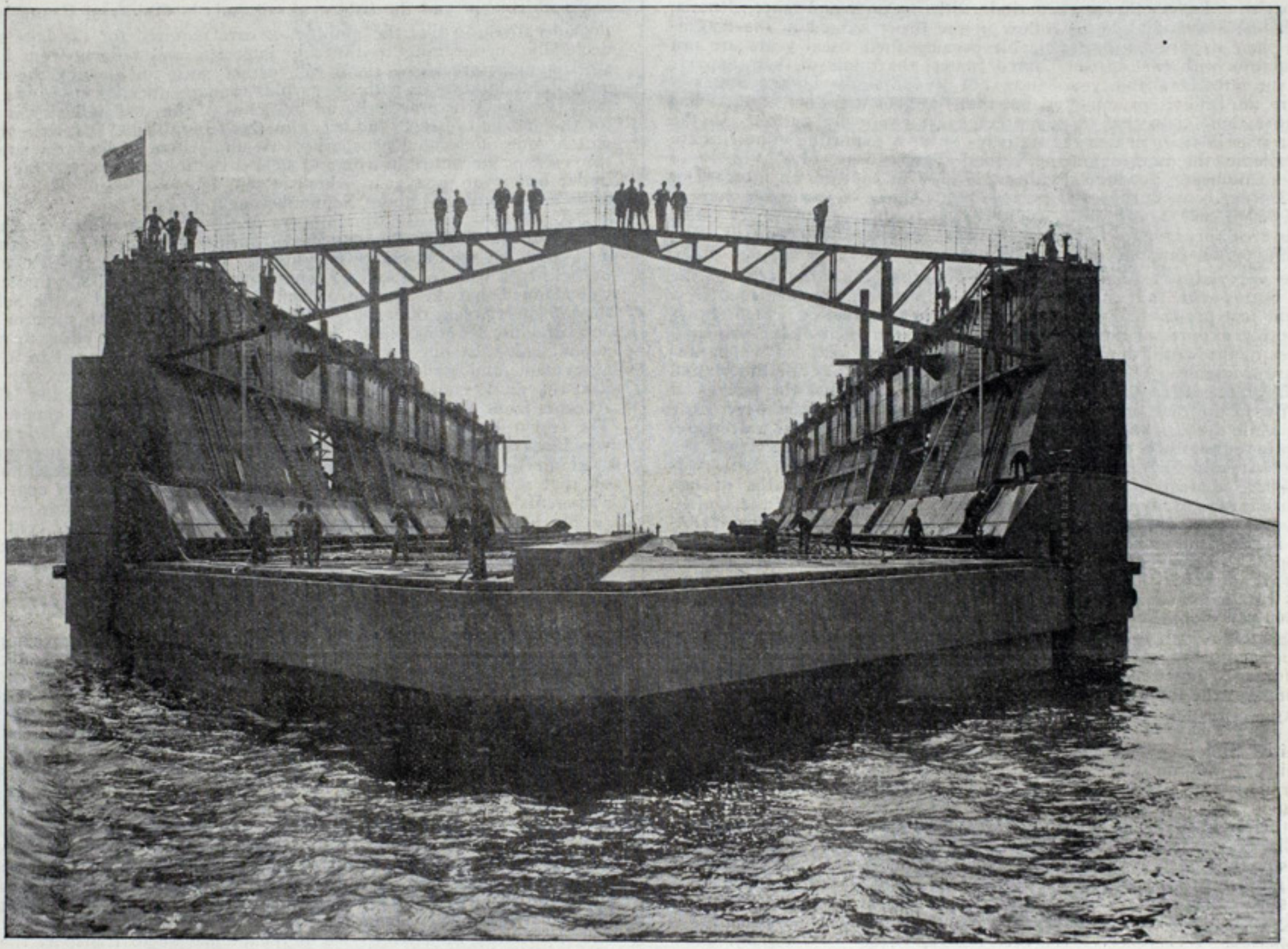
"In this great industrial development we have arrived at the period, aided by our resources, and the talent, the frugality and the ingenuity of our workingmen, where we are the greatest industrial nation in the world. Our exports now exceed our imports more than $500,000,000 per annum. The point has been reached where we must find wider markets for our products. You remember the last speech made by President McKinley at Buffalo. It was one of the most sagacious that he ever delivered. He saw that the time had arrived when the people of this country must consider their new trade relations with the world. Our manufacturers are going into every country in the world and are successful in competition. We must have wider markets. There is one thing missing and that is the connecting link, namely, a merchant marine to transport the goods. Every dollar's worth of goods we send out goes through the hands of the foreigner. Every time a commodity moves the foreigner must take a commission on it. The profit they take out by the time the goods reaches the consumer is twice that which any manufacturer wants. This is the one interest of our country that has been neglected. Suppose that when the Spanish-American war broke out England and Germany had engaged in war. The products of our farms in consequence would have rotted in our storehouses because not a British or German merchant vessel would dare be seen upon the high seas. This is a most serious question for us. Our work is not yet finished. Our beloved president saw it as the dawn of the morning. The next step for our country to take is not only to establish reciprocity, but make it possible for the American flag to be seen on a merchant marine as well as on the ships of our navy. Why should the stars and stripes not cover merchant vessels as well as men-of-war? If we are going to build an isthmian canal and are going to increase our navy to equal any in the world and are going to maintain our position on the firing line of the world, then we have got to maintain our position in the commercial and the industrial world. We cannot do so unless the stars and stripes are seen as often in foreign ports on merchant vessels as on the lakes and the rivers of our own country."

The Ryndam, the newest and biggest of the twin-screw fleet of the Holland-America line, arrived in New York on Saturday from Rotterdam and Boulogne. She made the run from the latter port in nine days and is expected when she "finds herself" to cover the course in eight days. The Ryndam is 585 ft. long, 62 ft. beam and 44 ft. deep and measures 12,527 tons gross. She has accommodations for 250 first-cabin, 200 second-cabin and 1,500 steerage passengers. She is more elaborately decorated than any other ship of the line and has compartments in her steerage for families and also smoking rooms. Her engines are of 7,500 H.P. and drive her at the rate of about 16 knots. She has bilge keels, a double bottom running the length of the ship and is divided by twelve bulkheads into thirteen watertight compartments.

ALGIERS FLOATING DOCK EN ROUTE TO THE MISSISSIPPI.

Baltimore, Md., Oct. 22.—The great floating dry dock for the United States government naval station at Algiers, La., started on her long voyage from Sparrow's Point, Md., Tuesday, Oct. 15, at exactly 10:12 a. m. This is undoubtedly the greatest tow ever taken to sea and if the dock is safely tied up at Algiers within thirty days from the start great credit will be due the Boston Tow Boat Co., which has undertaken the job. It is true that the Havana dock was towed from England across the Atlantic ocean to Cuba, but the Havana dock is of but 10,000 tons capacity as against the 18,000 tons capacity of the Algiers dock. Moreover, the trip around Cape Hatteras is more hazardous than the passage of the Atlantic. However, the utmost confidence prevails here that all will be well and that by Nov. 15 the monster dock will be moored in the Mississippi.

The dock left the yard of the Maryland Steel Co. at Sparrow's Point, Md., under tow of the tugs Taurus of the Boston Tow Boat Co. and Samson of the American Tow Boat Co. of Baltimore. Very little ado was made over the departure. A few invited guests made the trip as far as Sandy Point, a distance of about twenty-five miles. Among those present



THE GREAT ALGIERS FLOATING DRY DOCK JUST AFTER IT WAS LAUNCHED.
Built by the Maryland Steel Co., Sparrow's Point, Md.

were Mr. F. W. Wood, president of the Maryland Steel Co. and Mrs. Wood; Mr. and Mrs. R. K. Wood; Admiral M. T. Endicott, chief of bureau of yards and docks, and Com'dr A. C. Cunningham of the United States navy, under whose supervision the work of building the dock was done; George H. Hewes, government inspector; Gen. Adolph Meyer, member of congress from Louisiana and a delegate to the recent river and harbor convention held in Baltimore; Lieut. Joseph Beale, United States representative of Clark & Standfield of London, under whose plans the dock was constructed; Mr. Charles Pettigrew, superintendent of the Maryland Steel Co.; and Mr. A. G. Wilson, general manager of the marine department of the Maryland Steel Co.; Mr. S. Anderson, general manager of the dock construction department of the Maryland Steel Co., and Messrs. Champagne and Styrlander of the same department.

The crew of the dock consists of eighteen men under the command of Capt. Charles R. Miller. At Sandy Point the guests embarked on the tug Brittannia returning to Baltimore, and the collier Orion of the Boston Tow Boat Co. made fast to the tow lines, and with Taurus in the van the procession proceeded down the Chesapeake at a speed of about 5 miles an hour. It passed Cape Henry at 1:30 a. m. Oct. 17 and proceeded direct to sea under most favorable circumstances; course laid directly for the Bahama banks, thence to a point near Havana, and from there directly to the mouth of the Mississippi, thus keeping well clear of the American coast.

The Boston & Bangor Steamship Co., the Portland Steamship Co., the International Steamship Co. and the Kennebec Steamship Co., all of which have recently been purchased by Charles W. Morse of New York, have been incorporated into the Eastern Steamship Co. under the laws of Maine. The general offices of the new company will be in Boston.

FAMOUS OLD VESSEL WRECKED.

Newspaper dispatches from Sault Ste. Marie say: "The steamer Leland has returned from an inspection of the wrecked barge Montgomery. The vessel was found broken in two on the shore. All that was saved was the towline and some canvas." And thus endeth the career of one of the most notable vessels on the lakes. The Montgomery was one of the earliest of lake craft. She was built in 1856 by John Bushnell at Newport, Mich. (now Marine City), for Eber B. Ward. The Ward family, brilliant, but erratic, was one of the most enterprising on the lakes and had much to do with the development of ship building and iron making in the early days. The timber from which the Montgomery was built was practically felled at the ways. The vessel was originally a propeller and was named after Robert Montgomery, a personal friend of Eber B. Ward. She plied between Sarnia and upper lake ports and Chicago in the package freight business until 1878, when she burned at the Point Edward dock, left her moorings and floated down the river. Capt. Cyrus Sinclair (now the general manager of the Great Lakes Towing Co.) went after her with the tug Crusader and succeeded in saving what was left of her. The hulk was afterwards taken to Port Huron and made into a lumber barge. She pursued a fairly prosperous career until 1898 when she was sunk in collision with one of the Minnesota Iron Co.'s steamers in Lake St. Clair. She was raised and repaired and again entered the lumber trade to meet her present end. The Montgomery was one of the remnant remaining of the fleet which sprang into existence immediately after the completion of the first Sault Ste. Marie canal in 1855, though she never directly entered the trade for which Lake Superior is famous.

That none of the great ore interests have lost their faith in the Lake Superior region is evidenced by the fact that they are continually securing options upon properties there. The United States Steel Corporation, recognizing that its insuperable advantage over all its competitors lies in its actual ownership of the sources of the raw material, is constantly strengthening its position. It has just purchased forty acres of ore lands in Itasca county, on the extreme western end of the Mesabi range. Two years ago the Oliver Iron Mining Co., which is the title under which the United States Steel Corporation now operates its mines, purchased the old Diamond iron mine, situated twelve miles north and east of Grand Rapids. This new purchase is contiguous property and shows that the great corporation has faith in the property immediately surrounding the old Diamond mine. The purchase appears to have been made for the future and not for immediate development.

The Osaka Iron Works Ship Building yard at Sakurajima, Japan, successfully launched a new steamer for the Yang-tse service of the Osaka Shosen Kaisha last week. The steamer was christened Ta-chi-maru by Miss Toyo-aka and is the largest yet built at Osaka. She is a shallow-draught, twin-screw, steel steamer of the following dimensions: Length, 269 ft.; beam, 40 ft.; depth, 25 ft. 3 in.

SHIP BUILDING IN PHILADELPHIA AND VICINITY.

Philadelphia, Oct. 23.—Changes mentioned some weeks ago in the correspondence from this port which are to be made among the United States surveyors of Lloyds Register of British and Foreign Shipping are again a matter of interest. In the place of John Haug, who held this position here for many years, are Messrs. McAuslin, Farrar and Minchen, who have taken an office in the Bourse building and have entered on their duties in the inspection and classification of vessels building in the Delaware river ship yards. Their district extends practically from Cramps' ship yard to Newport News, including Neafie & Levy's yard, Dialogue's, New York Ship Building Co.'s, Roach's, Harlan & Hollingsworth's and in fact all yards where steamships are being built under Lloyd's classification. John Haug, who is about to retire as Lloyds surveyor in Philadelphia, carries with him the good will and best wishes of every branch of the shipping and ship building business of this port. He has classed some of the finest vessels ever turned out by any ship yard. He is unable to assign any cause for his removal other than that given by Lloyds Register "for the betterment of the service." Capt. William S. Samuels, representing the English underwriters, informed your correspondent that the system of inspection had been changed primarily through the failure or partial failure of three steamships recently built in this vicinity and which were given a rating of 100-A 1. A protest was made by the underwriters to Lloyds Register and the latter, desirous of maintaining its standing as the premier classification society, made wholesale removals, not only affecting this port, but Baltimore and New York as well.

Officers and cadets attached to the Chilean training ship General Baquedano, which for several days has been at anchor on the Delaware river, made several visits to Cramps' ship yard, at the invitation of Charles H. Cramp, president of the company. Capt. F. C. Gonzales, who is in command of the vessel, did not deny that Chile is looking to United States ship yards for war ships and said that a contract might follow the report which he will return when the General Baquedano arrives at Valparaiso. He explained that Chile needs light-draught vessels to patrol her long seacoast and is enthusiastic in his endorsement of the Machias and Castine type of the United States navy for this service. It is to be regretted that the Chilean navy pays so little attention to the development of the engineer force. Of the thirty-eight cadets on the training ship not one is a candidate for this important branch. Everything about the vessel is ship shape except in the engine room, and the lost motion and general untidiness are mute witnesses to the neglect.

The ferry boat Cape May, built by the Harlan & Hollingsworth Co. for the Philadelphia & Reading railroad, will be put in service between this city and Camden on Monday. This vessel was given a most severe trial trip for her class and her performance was eminently satisfactory. The run was straight away 40 miles and return and the average speed was over 10 knots.

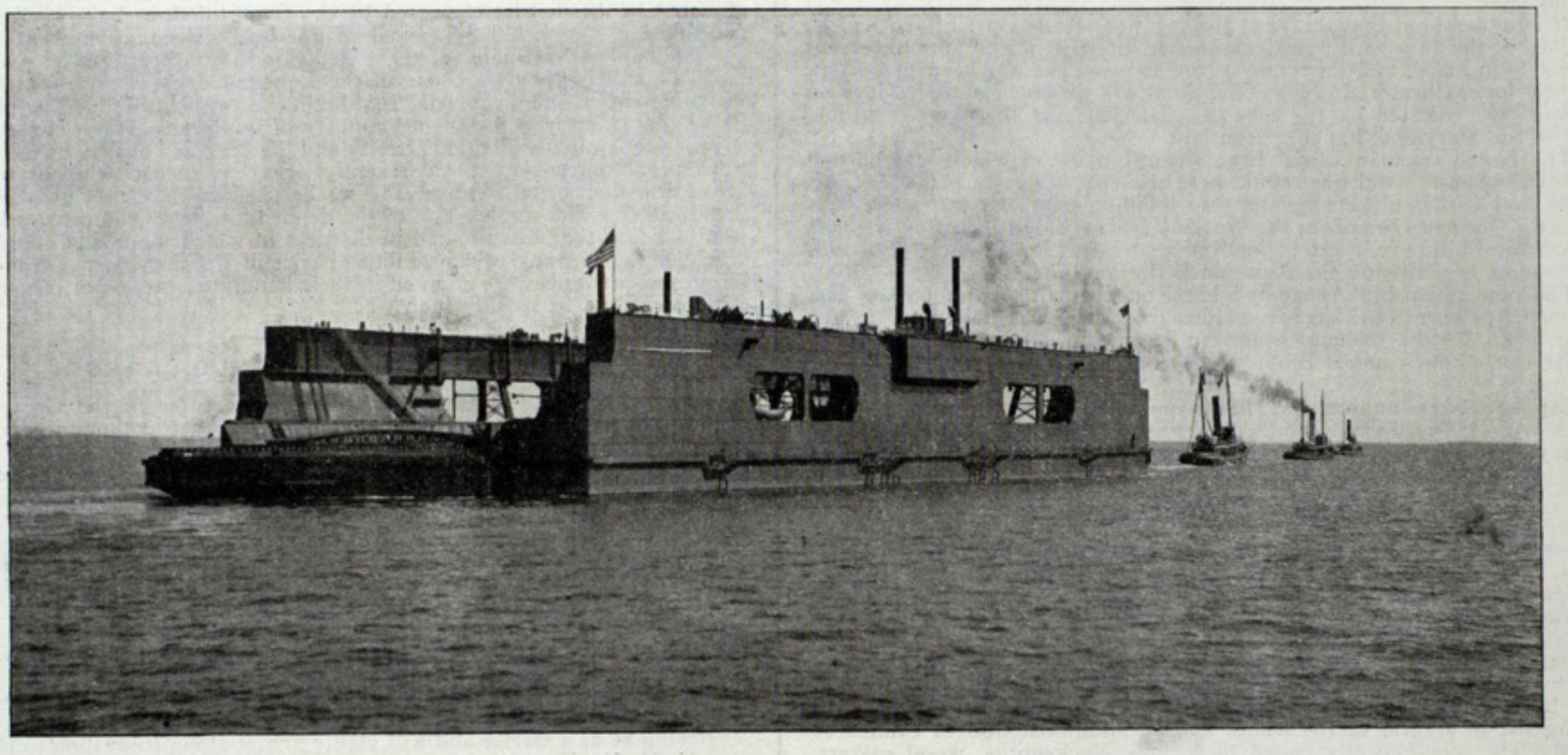
Having completed her charter as a transport for the British army in South Africa, the British steamship Jeanara is now in port from Algoa Bay to load a cargo of bituminous coal for St. Nazaire, France. She traveled over 10,000 miles to secure the cargo, her only stop being at St. Lucia for bunker coal.

The Merchants & Miners Transportation Co., operating a service between this port and Savannah, has secured a lease of a portion of the new steel pier owned by the city at the foot of Race street, Delaware river, and will shortly add another steamship to its fleet. Although a new venture this line has been eminently successful and has been of inestimable benefit to the port in bringing it in close touch with the heart of the southern manufacturing section.

Francis Brooke Gridlestone of Bristol, England, general manager of the Bristol dock corporation, arrived in this city a few days ago and will tour the entire Atlantic seaboard in the interest of a move to enhance the commercial importance of Avonmouth, which is Bristol's seaport for vessels of deep draught. The scheme is no less than to wrest from Liverpool its supremacy in the Atlantic carrying trade, and to this end upwards of $15,000,000 has recently been expended on the new Avonmouth docks. The Bristol corporation, in addition to $2,500,000 invested in docks in Bristol proper, is interested to the extent of $10,000,000 in Avonmouth, and Mr. Gridlestone says that as much more will be subscribed if the assurance can be obtained from shippers on this side of the water that their freight will go to that port instead of Liverpool. Charles M. Taylor's Sons, representing the Philadelphia Transatlantic Line at this port, believes that Bristol is the logical center for imports from this country. At present they are maintaining a Bristol and Avonmouth service from this port and they unhesitatingly promised the representative of English capital their support. Mr. Gridlestone will arrive on the lakes in a few days and will visit Chicago before returning to England.

The William Cramp & Sons Ship & Engine Building Co. is making rapid progress in the construction of the armored cruisers Pennsylvania and Colorado, which are going up side by side in their ship yard. The Colorado was put down several weeks in advance of her sister-ship, but an effort is being made to hurry the latter so that both may proceed at the same percentage towards completion. The builders are gratified that there is at present no scarcity of manufactured steel. They say they have an abundance of shapes and necessary material to rush the contracts.

The Neafie & Levy Co. will launch the torpedo boat destroyer Chauncey on Oct. 25. Her sponsor will be Miss Mae Chauncey Stevens of Grand Rapids, Mich. Another launch shortly to follow from this yard is that of the cruiser Denver. As soon as this vessel is in the water the keel of the cruiser St. Louis will be put down, all of the material needed for the preliminary operations having been delivered to the builders.



THE GREAT FLOATING DRY DOCK EN ROUTE TO ALGIERS.

Built by the Maryland Steel Co., Sparrow's Point, Md.

THE CHINESE JUNK.

At a meeting of the Institute of Marine Engineers at Stratford, England, last week a paper on "The Chinese Junk" was read by Mr. W. G. Winterburn. The author stated that it was quite conceivable that very little alteration had been made in the design of Chinese junks for ages, but many so-called modern ideas had been found utilized in Chinese vessels and had been in vogue with them from time immemorial. On the West river might, he said, be seen the prototype of the turret ship, bearing an extraordinary resemblance to the North of England productions. The Chinaman did not experiment, but he discovered things by accident and adopted them. The Chinese, without foreign assistance, were capable of building, and did build, capital wooden steamers up to 400 tons, and this, too, in Canton where it was not so easy to purloin drawings and ideas from European shops, because there were none there. The watertight bulkhead had always been a feature in Chinese naval architecture, and it was no uncommon thing to see a junk come into harbor with one end completely gone. There was generally one bulkhead forward and one aft, but sometimes the cargo space was subdivided also. The Chinese build their craft by pure rule-of-thumb, or, more correctly, old experience. As nearly all the timber used for ship building in China is imported, and as the country possessed illimitable quantities of iron and coal, besides other minerals, the author said that it was safe to prophesy that the day would come when ship building would be one of the greatest industries of the far east. The natives possessed all the qualifications for carrying on such work, and when the time came for transpacific liners to be built in China it would be found that the quality of the work would not be inferior to that of the Clyde. In replying to the discussion the author stated that Chinese workmen did their work very well after they had been taught, and they were not loafers. As mechanics they never initiated anything themselves, but were simply copyists. They were capable of understanding drawings, but there were only a few who could calculate out drawings. There were plenty of engineering shops in China in which no Europeans were employed.

Several cities in Canada have been at some pains to determine exactly where Sir Christopher Furness, who is now touring the country, thinks the steel ship building plant, which the government proposes to subsidize as soon as capital can be secured to found it, shall be located. Sir Christopher inclines to the opinion that Halifax is more favorably situated for ship building than Sydney—and the Halifax papers have consequently gone into paroxysms.

LAUNCH OF THE SECOND PACIFIC MAIL LINER

Newport News, Va., Oct. 23.—Fully 20,000 people saw the new Pacific Mail steamship Siberia launched at the ship yard last Saturday afternoon. It was one of the most notable events of the kind in the history of the city, and the ship yard and the list of distinguished guests was probably larger than on any previous occasion. All of the railroads and steamer lines touching the Hampton Roads cities ran special excursions to the launching, and it is estimated that there were 10,000 visitors in the city Saturday. The Siberia was released from the ways at 1:13 o'clock, and as the monster steel hull started down to the water she was christened by Miss Belle Norwood Tyler, daughter of Governor J. Hoge Tyler. The Governor was in attendance, with his staff and a large party of representative Virginians. A party of nearly 1,700 West Virginians came to see the launching.

Following the event, the Newport News Ship Building & Dry Dock Co. tendered a post-launching luncheon at the Casino in honor of the sponsor. About 200 guests sat down to the covers and impromptu toasts were responded to by Rear Admiral C. F. Cotton, U. S. N., commandant at the Portsmouth navy yard; Governor Tyler; R. P. Schwerin, vice-president and general manager of the Pacific Mail Steamship Co.; Colonel Jo Lane Sterne, inspector general of the Virginia militia, and others. President C. B. Orcutt, of the Newport News company brought a large party down from New York to attend the launching. Mr. Orcutt was toastmaster at the luncheon.

Much interest attaches to the Siberia and her sister-ship, the Korea, for the reason that they are the largest ships ever built in the new world. They have been described several times in the Review. They will ply between San Francisco and Hong Kong, with Honolulu, Yokohama and Nagasaki as ports of call. The Korea will be ready to leave for the Pacific in a few months, and the Siberia will be ready to follow about six months later.

It is understood that the new Morgan line steamship El Alba will be launched at the ship yard two weeks hence, but the official announcement has not been made, and the name of the sponsor has not been given out. The keel for the armored cruiser Maryland will go down in a few days on the ways just vacated by the Siberia. The keel for the West Virginia, sister of the Maryland, has just been laid.

The North German Lloyd Line steamship Main, which was burned in the Hoboken fire and was rebuilt here at a cost of nearly $1,000,000, was turned over to her owners by the ship building company last week. As soon as a German crew from the North German Lloyd forces arrives she will sail for Baltimore, there to load general cargo for Bremen. She will then resume her trips on the New York-Bremen line.

The new steamship Amsteldyk left Rotterdam the latter part of last week for Newport News on her maiden trip. She was built by Furness, Withy & Co. for the Holland-American Steamship Co., which now runs a regular line of ships here. She is the second of the new vessels built for this line.

Capt. J. W. Simmons has been appointed inspector of hulls and machinery for this district, under Supervising Inspector Oast, to fill the vacancy caused by the death of Inspector Johnson.

NAVY YARD SHORT OF HELP.

Just at present the Charlestown navy yard is confronted with a condition which is unique in its history. Enough competent skilled mechanics cannot be obtained to rush some of the work on hand as fast as it is desired by the navy department. Nothing was known about this threatened difficulty until the labor board commenced sending out calls for men some ten days ago. Some 400 postal cards have been issued requesting men to report for employment. Only about 40 per cent. of the postal cards have brought personal responses. There are no more names on the waiting list in several of the trades and so additional notices cannot be mailed. The men recently called in include blacksmiths, wood calkers, iron calkers and chippers, drillers, ship joiners, all-around machinists, hand tool machinists, floor and vise machinists, electrical machinists, painters, plumbers, riveters, ship fitters, shipwrights and wire men. The ship joiners, painters and riveters comprise the largest number. The department of construction and repair is greatly in need of iron workers, and today sixty-five were called in. They are desired to take care of the iron work on the new training ship Prairie and the Olympia, both of which ships the navy department wants put in commission as soon as possible. But it is not at all likely that either of these ships will be in readiness when desired. The Prairie, it is now thought, can be made ready so as to be placed in commission on the first of November, and the Olympia about Jan. 1..

A BUSY SEABOARD SHIP YARD.

The Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y., is very busy with new work. Among orders now under construction is a steel yacht for the German emperor, with keel laid and first set of frames up. Work on this yacht is being pushed as rapidly as possible, and will be completed in April. They have also in frame another large three-masted schooner-yacht for Mr. Gibson Fahnstock of New York, and are putting down an auxiliary steel schooner for Alessandro Fabbri. The coast survey ship Bache, which is building for the United States government, will be ready for a trial trip in about three weeks. A double-deck ferry boat, the North Beach, built for the New York & College Point Ferry Co., will be completed and delivered within a month. Two large steam lighters are also nearing completion on the ways and will be launched within a month. The rebuilding of the steamship Saale, one of the North German Lloyd ships destroyed in the Hoboken fire and purchased by Louis Luckenbach of New York, and which is to be turned into a cargo ship, is progressing rapidly. The hull work is about 80 per cent. completed and the engines about 70 per cent. The work of rebuilding the superstructure of the Pennsylvania railroad ferry boat Baltimore is about to begin and is to be completed within three months.

A British admiralty chart, Midland section of Georgian bay, will be sent, postpaid, to any address for $1.25; regular price $1.75. Size of sheet 3x4 ft. The Marine Review Pub. Co., Perry-Payne building, Cleveland. Chart of the whole bay on one sheet at the same price.

IRON ORES OF SOUTHEASTERN ONTARIO.

In a paper read before the Canadian Mining Institute at its last meeting, Prof. Willett G. Miller speaks as follows of the iron ores of the southeastern section of Ontario:

"The ores of economic interest are of two kinds—magnetites and hematites. The former occur largely as contact deposits, as already stated, the wall on one side being in many cases composed of crystalline limestone, while the other wall is some form of gneiss, often the scapolite-holding variety. The two districts in this part of the province which have been developed to the greatest extent are situated along the Kingston & Pembroke, the Central Ontario and the Irondale & Bancroft railways. Along the first-mentioned road the deposits which have been worked in recent years are found at different points for a distance of about 50 miles, beginning 30 miles north of Kingston. All the deposits recently worked here are composed of magnetic iron ore. Much of this is coarse in grain and thus differs in appearance from the characteristic fine grained and slaty magnetites of the northwestern region. Outside of silicious material many of these ores are very pure, but the ore from a few deposits contains enough sulphur to lower its grade. Years ago some hematite deposits were worked in the district lying east of the Kingston & Pembroke railway, the most important being in Lanark county. Along the Central Ontario railway the magnetite deposits which have attracted most attention are those of Belmont and Coe hill, although much has been done on a number of others. The deposit which has been worked most continuously along this line of railway is, however, composed of hematite and is known as the Wallbridge mine. Years ago this deposit was thought to have been worked out and was so described, but during the last few years it has produced a considerable amount of good ore. One of the chief reasons for the beginning of the construction of the Irondale railroad was the transportation of iron ore from a number of deposits known to be situated in the district traversed by it. Some of these have been worked at different times. They are all magnetites. Although high-grade ore is obtainable from many of these deposits in southeastern Ontario, they are of smaller size than those of the Lake Superior region and are thus to some extent handicapped. No doubt, however, now that the province is becoming an iron producing country of importance, these deposits will be the scene of considerable activity and the ores will always be in demand for special purposes. Only recently ores have been shipped from the Kingston district to Pennsylvania to be used in the production of high-grade steel. The smaller size of the deposits is partly compensated for by the fact that they are situated in districts in which labor and supplies are cheaper than in any other mining district in the province. Moreover, if approved methods were adopted in their handling, the output of merchantable ore could be greatly increased."

GREAT LAKES SAILORS' SNUG HARBOR.

Mr. George L. McCurdy of Chicago, treasurer of the Great Lakes Sailors' Snug Harbor, has received, among other communications, the following:

Admiral W. S. Schley—"All purposes which have in view the aid and care of disabled seamen, or their widows and children, have my interest and sympathy. I shall be glad to contribute something to the purposes you have under consideration, even though it may be small in amount."

William Mueller Co., Chicago—"It is a great pleasure to us to enclose check for $10 in payment for two souvenir tickets to entertainment for benefit of Great Lakes Sailors' Snug Harbor."

Congressman Irving P. Wanger of Pennsylvania—"With best wishes for the success of the Great Lakes Sailors' Snug Harbor, I am enclosing check herewith for $5 to the order of the treasurer."

J. E. Yax, Chicago—"I think such an institution as that proposed will do a lot of good if properly conducted, and I wish it success. I am enclosing $2 as a starter and will gladly help it along from time to time."

C. M. Davis, marine surveyor, Milwaukee—"Enclosed please find $5. I have much sympathy for old sailors and their families. I expect to be an old sailor myself and settle down on a farm some time in the future."

Capt. Duncan Stalker, steamer Pueblo—"An institution of the kind proposed would certainly be all right if properly managed, as I think it will be. I enclose $1 for entertainment ticket."

ENGINE OF THE SWALLOW.

Capt. Thomas Bixby, under whom Samuel M. Clemens (Mark Twain) served as pilot and "engineer" on the old Mississippi river boat Swallow, has given the following quaint description of the engine of the Swallow:

"The Swallow had the queerest sort of engine that was ever seen. The craft itself was a little shaky—it only plied between St. Louis and Cairo—being about 30 ft. long, with a stern wheel, a place for freight and passengers, a pilot house, and a place on what may be called the pilot deck for the engine. That engine went aboard when it was needed, and only then. It burned no wood nor coal, but ate a powerful sight of grass. It was a large grey mule named Jerry, which worked a treadmill that propelled the boat. Sam Clemens—you know his name of Mark Twain came later—was chief engineer and pilot. He had a system of signals and they were ingenious. By pulling a cord he could raise a head of cabbage just out of the reach of the mule. The engine would start for it and begin to walk after it, and the boat floated majestically on down the river or up, as the case might be. When Sam wanted to stop he would pull a rope attached to the feed-box of the engine. Without intending to be personal, I will say that Jerry was one of the most intelligent animals I ever met. His voice was more on the order of a fog horn than a whistle—it was too much of a baritone for the latter. When Sam wanted to whistle for a landing he hit Jerry with a stick. If he wanted, in the profane language of the river pilot, to go ahead like h—, he gave Jerry a touch of the whip."

The Spedden Ship Building Co., Baltimore, Md., being the lowest bidder for the construction of two steel steamers of the United States revenue cutter service, is likely to receive the contracts. One is for the Boston station and the other is for the great lakes. The Boston boat is 96 ft. 6 in. long with 20 ft. 6 in. beam and 10 ft. 3 in. depth. The great lakes cutter is to be 110 ft. long, 20 ft. 6 in. beam and 12 ft. deep. Both vessels are to have triple-expansion engines and the Scotch type of boilers.

MINISTER TARTE WIELDS A LASH.

HE CENSURES THE HARBOR COMMISSIONERS OF MONTREAL FOR WHAT HE CALLS THEIR DO-NOTHING POLICY.

J. Israel Tarte, the minister of public works of the Dominion government, has just asked the city of Montreal the pertinent question "Where are we at?" It is asked, however, under vastly different circumstances from those which accompanied the innocent inquiry of the somewhat bibulous congressman, who in the house of representatives permitted his mind to wander in a speech until he no longer knew what he was talking about and asked "Mr. Chairman, where was I at?" Mr. Tarte has just written two articles for La Patrie which have thoroughly stirred up the town of Montreal. He has attacked the harbor commissioners and their engineer with considerable vigor. His first letter reads:

"Mr. Kennedy declared, at one of the latest meetings of the harbor board, that he wanted time to reflect before coming to a decision regarding the equipment of the wharves and the works now in course of construction. It has been fifteen years since Mr. Kennedy and his staff have had the direction of the harbor works, and this long period has been given over almost exclusively to 'reflection.' When the present government came to power the harbor of Montreal was in a most dilapidated condition, and its equipment was absolutely insufficient. At present it is the equipment of the wharves which is the most important. It is a dishonor and a shame to see the way freight is handled at our port of Montreal, and if it were not for our advantageous geographical position we would have lost the greater part of our trade. Mr. Kennedy's policy of reflection is that of the ancient regime, which consisted simply of marking time. At the way things are now going we despair of seeing the port of Montreal properly equipped for several years to come. There are without a doubt a certain number of commissioners who, to embarrass the government, would stop at no obstruction, while others are old fogies and behind their time, and unfortunately the progressive men have not affirmed themselves as they should have done. Let it be well understood that the government takes no initiative in the affairs of the harbor, and all the responsibility for delay falls upon the commissioners themselves. As a matter of fact, according to present appearances, the port will not be in a better condition during next season than it was this, although it was solemnly promised that the works would be completed this fall. Where are we, anyway? The administration of the port of Montreal, and that of our municipal affairs may in truth be weighed in the same scales. We have no street, no serious improvements in view for our city, no equipment for our port, yet we claim to be the commercial metropolis of Canada. 'Private interests and the schemes of wire-pullers and speculators have played a great role in our municipal history. Will we continue to be the victims of a state of things that has done so much harm in the past.'"

The second article from the minister of public works is equally pointed, and reads as follows:

"Under the old regime they discussed for ten years the plans for the harbor improvements. They discussed, discussed, and discussed again, and since 1896 it has required extraordinary efforts to replace discussion by serious and efficacious work. It appears, however, that this has all to be gone over again, for they have started in to discuss and do nothing. Two years ago the minister of public works had obtained from his colleagues the sum, at least, of $500,000 to construct an elevator at the expense of the state. As it is the practice, however, only a part, $250,000, was placed in the estimates, but it goes without saying that all the money necessary to construct a powerful elevator would have been voted. Halifax and St. John have elevators built at the expense of the government. Now, will it be believed, that there were in Montreal people sufficiently blind to the requirements of the port to ask that this sum be not expended for the benefit of our port and of our city. In their eyes everything done by the minister of public works is bad, for he was imprudent enough not to think as they do, and he has the capital defect of being a Frenchman. The net result of all this pulling and hauling is that we have not yet got an elevator. The magnificent work that is now being proceeded with in the eastern part of the harbor is being done at the expense of the federal government, and this, in spite of the violent opposition of the same clique, which seeks by every means possible to prevent the carrying out of our harbor improvements. The wonder is, in fact, that such old fossils are able to do so much harm in so enlightened a city as Montreal. It is true, that a do-nothing policy is easier of execution, and is also one that demands less talent. While the harbor commission is losing its time in sterile discussions, the Canada Atlantic is preparing to leave us, just as the Grand Trunk left us, and the Canadian Pacific is doing work at Three Rivers. While rival cities are being rapidly equipped the navigation companies are losing confidence in us and we may well ask, where will it all end?"

Mr. Tarte recently rejected the proposition of the Wolvin syndicate to provide terminals at Port Colborne and Montreal because, as he said, he believed that the syndicate was merely in effect asking the Dominion government for the loan of money at 5 per cent.

THE CLERGUE PLANT AT THE SAULT.

In a paper published in the latest report of the Ontario bureau of mines, Mr. F. N. Speller gives the following description of the plant which the Lake Superior Power Co. is erecting at Sault Ste. Marie:

"The coke to be used at the Sault must be brought from either the Connellsville or Punxsutawney district. This is the most important item in the cost sheet of the locality under consideration. It means an approximate haul of 210 miles by rail from Connellsville to Lorain or Cleveland, and a water haul to the Sault equivalent to 80 miles of rail haul. As it will require 1.70 tons of coke to smelt an equal quantity of ore and produce one ton of pig iron, applying Mr. Moxham's freight we find that it will cost about $1.97 to bring this fuel within easy reach of good ore and limestone on the north shore of Lake Superior or at the Sault; so that it appears quite evident that the cost of assembling the necessary raw material—coke, limestone and iron ore—in the neighborhood of Sault Ste. Marie should be much less than at Pittsburg. At present the bessemer steel works and rail mills are being installed with three 8-ft. cupolas for melting the pig iron for conversion. The pig iron will be provided by the Midland furnaces, until the large pair of blast furnaces now being designed are completed, when the direct metal process will be adopted. The bessemer plant will consist of two acid-lined converters of 5 tons capacity each. The metal, after being blown, is handled as in the best modern practice, by pouring into moulds on buggies, the ingots being stripped after standing a few minutes. The stripping is done by means of an overhead stripping crane, designed by the Wellman-Seaver Engineering Co. of Cleveland. This crane is also provided with an auxiliary trolley which is used to change the ladles on the ladle crane. The ingots are then conveyed to the pit furnaces (soaking pits) consisting of two four-hole furnaces. The ingots are drawn and charged in these furnaces by an overhead electric drawing and charging crane, designed by above-named company, which also delivers the ingots on the blooming mill tables. They are then passed through the 32-in. blooming mill, driven by a pair of 28 by 48-in. reversing engines built by the Southwark Foundry & Machine Co. of Philadelphia. The blooms are then sheared to the proper length in proportion to the section of rail into which they are to be rolled, and next are conveyed to four Siemens regenerative heating furnaces. The overhead drawing and charging crane is used in connection with these reheating furnaces for charging and drawing the blooms. This crane also delivers the bloom on rollers which run to a 23-in. rail mill driven by a 40 by 48-in. Porter-Allen engine, built by the Southwark Foundry & Machine Co. There are in this mill three stands of rolls; first and second roughing, and finishing rolls. The material is handled and manipulated at the rolls by electrically driven transfer tables, designed by the Wellman-Seaver Engineering Co. This train is covered by an overhead electric traveling crane, which is used for handling rolls and spindles when changing from one section of rail to another. After leaving the rolls the rails are run to the hot saws, where they are sawn to the required lengths. They are then passed through a cambering machine and conveyed to the hot beds, where they are permitted to cool sufficiently to be finished in the cold finishing department. Here the rails are straightened, inspected and drilled, then handled by pneumatic overhead hoists and loaded on cars under cover for shipment. The cold finishing department being all under roof, the product is carefully protected until loaded on the cars. The plant is laid out with a view to handling rails in 30 or 60-ft. lengths, up to 85 lbs. per yard, and structural materials, such as angles, channels, beams, etc."

From the above description it will be observed that, where possible, electricity is used to replace steam, owing to the cheapness of power in this form furnished from the water power plant of the Lake Superior Power Co. The material and product is handled throughout the works with the most approved modern labor-saving machinery. The engineering work of the plant has been entirely under the direction of the Wellman-Seaver Engineering Co. The boiler plant for supplying the necessary power consists of the modern type of water-tube boilers. Gaseous fuel is furnished for the soaking pits and reheating regenerative furnaces by the Talbot-Fraser gas producers. The plant is close to the terminal of the Algoma Central railway, which affords excellent facilities for the handling of raw and finished material, both by water and by rail. All the buildings are of the artistic design adopted in other mills of this company, and built of St. Mary's sandstone, with corrugated iron roofs supported on steel frames.

AROUND THE GREAT LAKES.

Vesselmen in Chicago feel that they have by argument with members of a harbor committee of the city council side-tracked a measure that proposed to lengthen the hours when the bridges are closed from two hours night and morning, as at present, to four hours. After listening to the arguments of the marine men the committee voted to place the ordinance on file, which virtually kills it.

A red gas buoy, formerly on Southeast shoal, Point au Pelee passage, Lake Erie, has been placed about ⅜ of a mile to the northward of the Detroit river light in 18 ft. of water. A new lamp has been placed upon the buoy. Capt. Dunn of the Dominion steamer Petrel says there is not 20 ft. of water anywhere between the buoy and the Detroit river light, and he urges masters of vessels to be careful not to foul the buoy.

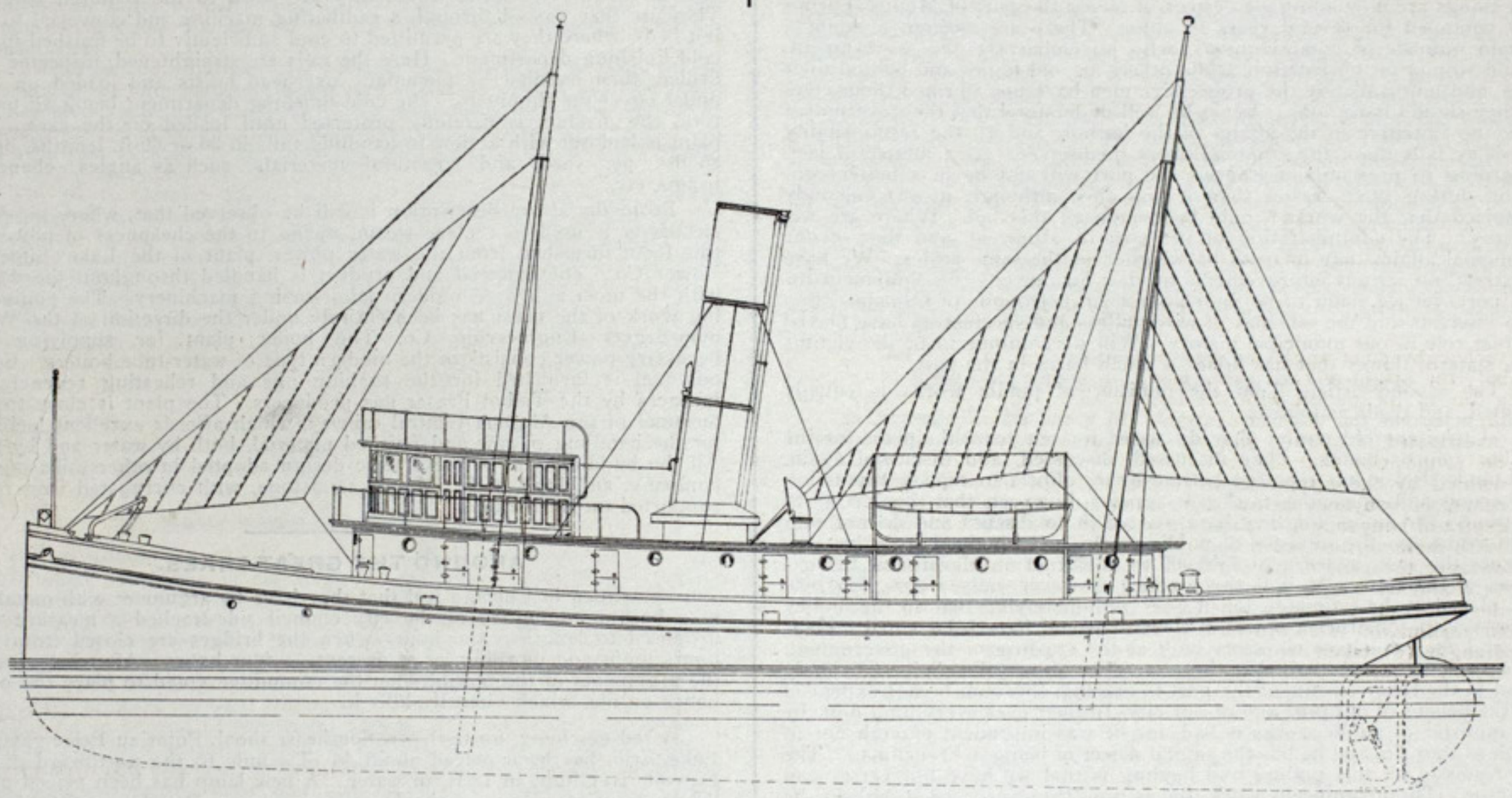
There is some error in the statement that the 112 vessels of the United States Steel Corporation on the great lakes are being operated without insurance. Ships of what were known as the Mutual and Menominee fleets before the consolidation, as well as the so-called Wolvin ships, are still insured. Bonds outstanding against these vessels when they were taken over by the Steel Corporation necessitated insurance. It is not probable, however, that they would have been insured but for the bonds.

Flattering reports come from Duluth regarding the Stevenson iron mine of the Mesabi range, controlled by Corrigan, McKinney & Co. of Cleveland. The mine has already shipped 550,000 tons, and before the end of the season will have shipped 700,000 tons. This is four times as much ore as was ever put out by any other open pit mine during its first year. The Mountain Iron, Biwabik, and Mesabi Mountain mines each put out, in round numbers, about 150,000 tons in 1893, the year they were opened. Since then the first mentioned mine has shipped in one season more than 1,000,000 tons, and both of the others have made high records, but the record of the Stevenson for a first year mine has never been eclipsed. It is true that some ore was shipped from the Stevenson property in 1900, but it was not from the open pit proposition.

J. E. Botsford and others of Port Huron are in earnest regarding plans for the establishment of a ship yard, either at St. Clair or Marine City on the St. Clair river, for the construction of steel vessels. The Port Huron & Duluth Steamship Co., of which Mr. Botsford is president, already operates, in connection with the Grand Trunk Ry., the steamers Wm. Castle Rhodes, Spokane and Harlem, all steel vessels of 3,000 to 3,500 tons capacity, and it is said that a contract recently made with the Grand Trunk for business between Duluth and Port Huron will necessitate the charter or construction, as soon as possible, of at least four more steamers. If ships are built they will probably be of special design for the grain trade, as plans now being made involve a hopper arrangement of hold compartments that is entirely new.

OCEAN-GOING TOWBOAT VIGILANT.

The new steel, ocean-going towboat Vigilant, built for the South Atlantic Towing Co. by the Neafie & Levy Ship & Engine Building Co., Philadelphia, is 120 ft. long, 22 ft. 6 in. molded beam, nearly 24 ft. over fenders and 13 ft. deep. She is built of steel throughout with steel deck house and all parts of the structure are very heavy and substantial. She was modeled especially with a view to combine speed with the best towing qualities, and has proved equal to the expectations of the owners and builders in this respect. She has six steel bulkheads, the forward and after bulkhead forming tanks, the capacity of which is 27 tons of water, about 8,000 gallons. She carries in her three bunkers 70 tons of coal. The deck house is arranged with mess room forward with ample seating accommodations for the crew, after which is the galley, fitted up with range, sink, shelves, lockers and all the necessary appliances. A steel bulkhead separates this from the boiler space. In the upper fireroom forward, on the starboard side, is a steel-enclosed stairway to the upper deck, and on the port side opposite this is a steel shelf for drying hawsers. At the after end of the boiler space there are two state rooms conveniently fitted up for four berths and lockers. Immediately after these rooms is the engine room, the after end of which contains toilet rooms, one opening on deck for the use of the crew, and the other of the most modern style opening into the after cabin for the use of the officers. The after cabin occupies the end of the steel deck house and is lined with oak, finished natural color. The after corners of the after cabin are occupied respectively by the ice house and lamp room, entrance to both of which is obtained from the deck. This deck house is fitted with large brass side-lights of the regular ocean steamship type, thus rendering the boat seaworthy in the roughest water. On the upper deck, forward, is the pilot house, which is adjoined by the captain's room, which is conveniently arranged for the commanding officer, with berth, lockers, drawers, side desk, wash-bowl of the most approved type, etc. Below, forward, is the forecastle with eight berths for the crew and ample room for their accommodation. Immediately after the engine room below is a large room with two hatches to the deck, arranged for the stowage of lines, hawsers and such appliances as are used in ocean towing. Throughout the boat care has been taken to arrange the accommodations so that comfort can be obtained in hot weather, which is of great importance.



OCEAN-GOING TOWBOAT VIGILANT FOR THE SOUTH ATLANTIC TOWING CO.
Built by the Neafie & Levy Ship & Engine Building Co., Philadelphia, Pa.

The propelling machinery consists of a set of triple-expansion engines of the most recent design, with independent condenser and independent pumps of the same style as are used on the first-class Atlantic steamers. The engine has cylinders of 14, 21 and 36 in. diameter by 36 in. stroke, and is of strong construction and fully up to the Neafie & Levy company's high standard of excellence. The engine was made from new patterns, with a view to obtain freedom from vibration and ample length of bearings. The condenser is supplied by one of Neafie & Levy's improved circulating pumps, with a capacity of 5 tons of water per minute, thus insuring good vacuum, even in tropical waters. There is a fire and wrecking pump and feed pump, both of the independent duplex type. The air pump is of the twin vertical beam type. On the starboard side of the engine room is a large evaporator for the production of fresh water for use in the boiler, and the electric plant, which is of the same style as that installed in the American line's most recent steamers. The boat is lighted throughout by incandescent lamps and has a lens mirror projector on the foremast capable of throwing an intense beam a great distance. The running lights are also electric and all the details are thoroughly modern. The boiler is of the Scotch type, of steel, 13 ft. 2 in. diameter and 12 ft. long. It is built of steel to United States treasury regulations and in accordance with their requirements for a working pressure of 175 lbs. per square inch.

The Vigilant is a credit to her builders and a source of pride to her owners. She is one of the few tug boats that has maintained on her trial the full boiler pressure unchanged and maintained the same revolutions from beginning to end, there being no slowing down for any cause whatever throughout the entire run. She did this with the throttle wide open and the boiler supplied an abundance of steam from beginning to end. Her speed during her trial was 15¼ miles, and the machinery worked throughout without a hitch of any kind. When the trial trip was over the Vigilant could have turned around and repeated the performance at one minute's notice. Experienced towboat men say they have never yet seen a towboat in which the combination of hull and machinery were so well suited to each other, making her in their opinion a perfectly balanced and satisfactory ocean-going tug. Her handiness in turning, which is an important feature in towboat work, is exceptionally good. It is a question whether any boat of her size has ever been built that is so thoroughly harmonious and that has shown such a remarkably uniform full-power trial record.

INCREASE OF THE NAVY.

It is the belief in Washington that President Roosevelt will recommend to congress in his annual message a substantial increase in the navy. A day or two ago Representative Dayton of West Virginia, one of the most active members of the house naval committee, had a lengthy interview with the president. Mr. Dayton believes that three or four battleships and a like number of armored cruisers will be authorized. Mr. Dayton was one of the men who was violently opposed to the policy forced upon congress by the senate at its last session to simply lay out a program instead of authorizing the construction of a reasonable number of battleships and cruisers. What the navy needs is ships, not specifications.

"I never have been a very strong advocate," said Mr. Dayton, "of building up the smaller class of vessels for the navy, such as gunboats, although there is, of course, a necessity for some craft of that class. The Spanish war taught us that we could buy any number of gunboats, and that we could convert any number of yachts into dispatch boats; that we could get protected cruisers by the wholesale, but we could not buy a battleship anywhere. I do not believe that the sentiment of this country will tolerate for a moment the idea that the American navy is a finished product or that its increase is to be checked because we are in times of peace. If we are to build an isthmian canal and hold our possessions in the Pacific we have got to realize that the proper thing to do is to have defenses ready, and for these defences we have got to depend on the navy more than on anything else. I have reason to believe that the president is in entire accord with the ideas I have now expressed."

"I was very delightfully surprised to find, upon a recent visit to the Pacific coast, what excellent navy yards we had at Mare Island, Cal., and Bremerton, Wash.," continued Mr. Dayton, "and to find how economically the money had been expended in building up those yards. In my judgment Puget sound is the finest body of water in the world, and the possibilities of building up a great navy yard at Bremerton are ideal. The natural advantages cannot be surpassed anywhere, and I think congress will make a mistake if it does not go to work systematically to build up such a yard there. Its geographical position is also important and advantageous in its proximity to Alaska and the Northwest territory. The start that has been made there is all that could be desired."

Capt. M. M. Drake of the Merchants' Exchange, Buffalo, is not an advocate of the ship-canal for New York state. He thinks the plan impractical. He has arrived at this conclusion through his own experience as a vessel owner. "Ships going through the Welland canal," said he, "make about a mile or two an hour. The rate of speed might be increased in a better canal, but the expense of taking a ship through with a big crew at the rate of a few miles an hour is too great. A ship-canal would be of no practical value." He believes in enlarging the present canal to 1,000-ton barge size.

METHOD OF CALCULATING CURVE OF STATICAL STABILITY.

By GEORGE CROUSE COOK.*

Among certain notes on stability from the course in naval architecture at the Glasgow university, Glasgow, Scotland, I find the following splendid mathematical demonstration of a method for calculating the curve of statical stability from a basis of the conventional displacement curves plotted for varying angles of inclination. As to the actual practical value of the method I cannot speak positively, having never performed original calculations by this method, but without accurate graphical execution it will be obvious that considerable error may occur and it is therefore to be used with much discretion.

With the required body plan at hand the work should begin with the calculation and plotting of a series of displacement curves, that is curves representing the volume of displacement at corresponding draughts for

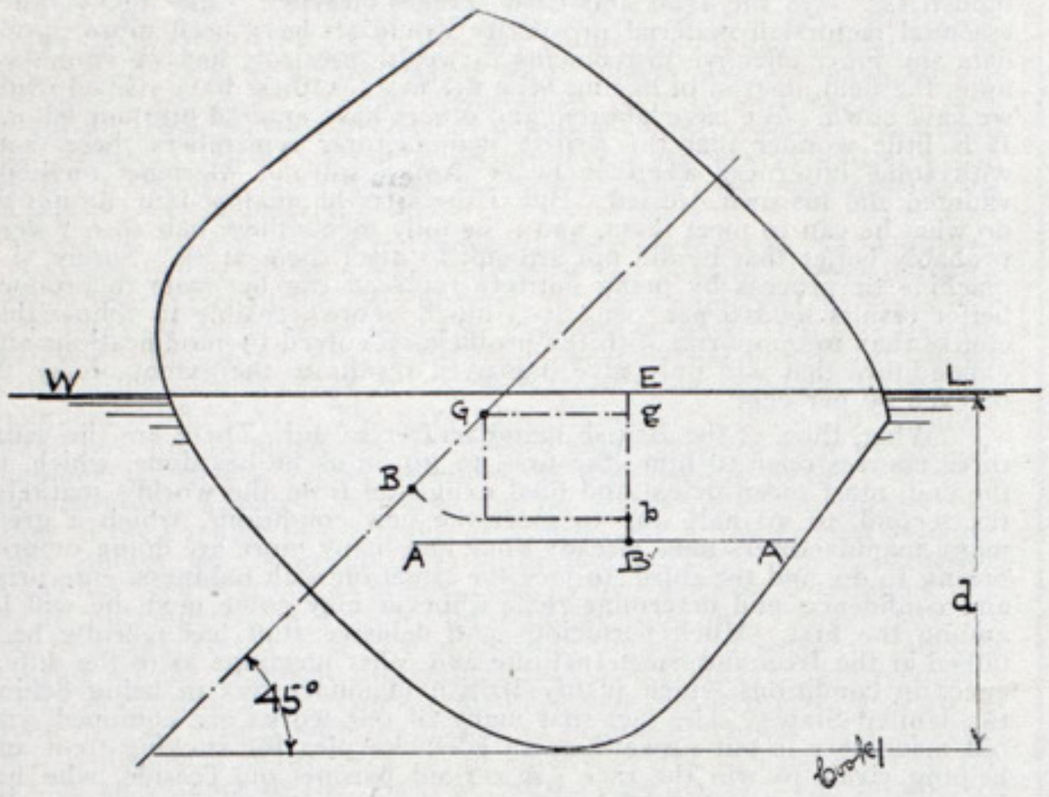


FIGURE #1

such convenient angles as may be chosen, say 15°, 30°, 45°, etc., up to 90°; the origin of each curve being, of course, the point of tangency of a line of inclination with the largest section on the plan. On each of these curves the displacement for which the stability condition is to be investigated is marked and the limiting draught line drawn. Then by the proposition that the area of a curve of displacement to any draught divided by the displacement at that draught gives the distance of the center of bouyancy below that water line, the vertical position of the center of bouyancy at each angle of inclination may be found and plotted. With these vertical positions of the centers of buoyancy known, the actual distance the centers have moved vertically, or the dynamical arms, may be found by simple comparison and measurement with the position of the center of bouyancy when upright. This stage of the work for the 45° inclination is shown in Fig. 1, where W L has been plotted by the draught (d) taken from the corresponding displacement curve, and the vertical position of the new center of bouyancy (B') has been found at

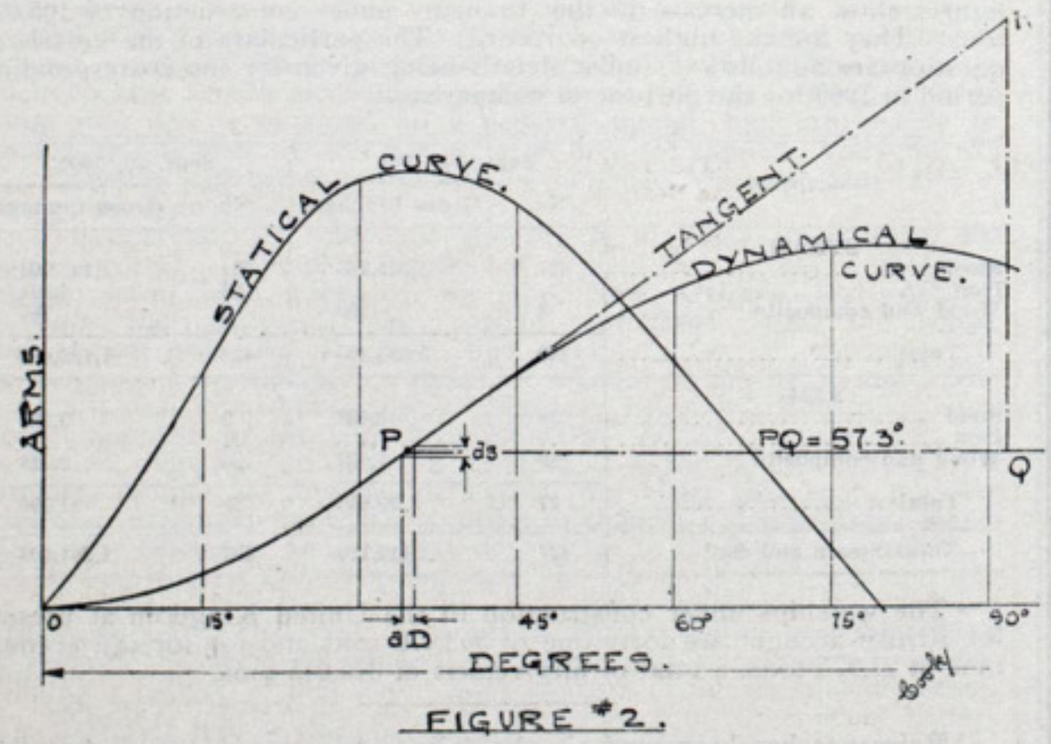


FIGURE #2.

a distance E B' below W L in the parallel line A A. Projecting B upon E B' gives the dynamical arm b B' (g B'-g b) for this condition. A curve of dynamical stability is then plotted from the arms thus found. See Fig. 2.

A second well known proposition of the science of theoretical naval architecture shows that the dynamical stability of a vessel at any given angle is equal to the area of the curve of statical stability to that angle. This is equally true when applied to curves of stability arms only and leads naturally to the following demonstration, which may be readily understood with an elemental knowledge of the calculus: Let the dynamical arm at P in Fig. 2 be represented by s; let the corresponding statical arm be h. Then by the proposition:

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$$s = \int h \cdot d D.$$

$$ds = h \cdot d D.$$

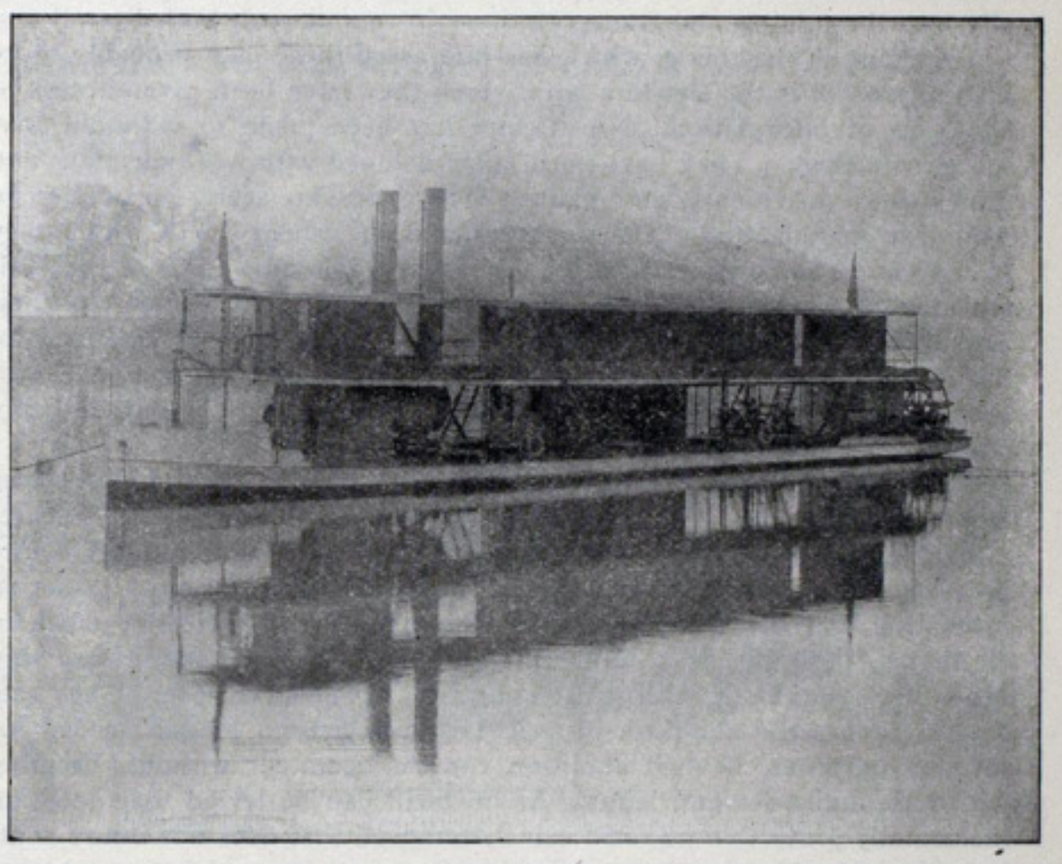
$$h = \frac{d s}{d D} = \text{tangent of slope at P.}$$

From this, then, it is seen that the ordinate of the statical arm curve at any point is equal to the tangent of the slope of the corresponding dynamical arm curve at the same point or that this ordinate (h) is equal to the tangent of the angle R P Q. Therefore, if P Q is drawn to such a length as to represent unity, that is 57.3° on the scale of the base, Q R will be the measure of the tangent of this slope or the statical arm at the angle of P. So, by drawing a series of these tangents and measuring the Q Rs the ordinates for the curve of statical arms for the required condition may be plotted. The acuracy of the statical curve found by this method depends, of course, upon the skill with which the tangent is drawn to the dynamical curve, as the slightest error in the direction of the tangent at P will cause considerable variation at Q R. I have checked this method in cases where both curves were already determined by the usual calculations and found a sufficiently low percentage of error to justify its judicious use when the usual instruments are not to be had and a fairly accurate idea of the stability condition is desired.

The writer would be gratified to have correspondence with anyone interested in the use of this method or with anyone failing to fully understand the principles and application of any part from the description.

NOVEL TYPE OF STEAMER.

Messrs. John I. Thornycroft & Co., Chiswick, England, have just completed to the order of Dr. Grattan Guinness the stern-wheel steamer Livingstone for the service of the Regions Beyond Missionary Union on the Congo. The vessel, which is the largest of its kind built for missionary work, is 111 ft. long over all, 19 ft. 3 in. broad, and will draw 2 ft. 6 in. of water when carrying 20 tons. Her speed when so loaded is to be 10 miles an hour, and this is guaranteed under penalties. A further guarantee is given by the firm that the vessel is to steam 9 miles an hour at the same draught when burning wood fuel, as wood only can at present be obtained on the Congo for fuel. The engines will be compound, having cylinders of 17 and 28 in. diameter and a stroke of 48 in., and these will be supplied with steam from two large locomotive boilers. The vessel is handsomely fitted up. The sleeping cabins, dining saloon, bath rooms and lavatories are on the upper deck, and also a hospital. The windows to cabins are all fitted with mosquito-proof gauze panels, which can be used when the glass panels are open, the object being to reduce the risk of malarial fever which is spread by insects. Special care has been taken by the builders to reduce the amount of strutting and tying, which is frequently carried to such excess on stern-wheel steamers as to greatly encumber the deck and to make it difficult to get cargo in and out. The vessel will be taken to pieces and shipped to Matadi, from whence it will be transported to Stanley Pool by the new Congo railway.



STERN-WHEEL STEAMER LIVINGSTONE FOR THE REGIONS BEYOND MISSIONARY UNION.
Built by John I. Thornycroft & Co., Chiswick, England.

LAUNCH OF SUBMARINE TORPEDO BOAT SHARK.

The submarine torpedo boat Shark was successfully launched at Lewis Nixon's ship yard, Elizabethport, N. J., last Saturday. The Shark is one of five torpedo boats building by Lewis Nixon for the United States government. The ones already launched are the Adder, Porpoise and Mocassin. The Plunger is almost ready and will be launched in the course of a few weeks. The Shark is 63 ft. 4 in. in length and 11 ft. 9 in beam. The sections of the boat are in circular formature, and the displacement submerged is 120 tons. She has a 160 H.P. gasoline engine for surface running and a 70 H.P. electric motor for driving her under water. The power is obtained from storage batteries carried on board. She is expected to make a speed of 8 knots an hour on the surface and 7 knots when submerged. She is armed with five Whitehead torpedoes, which are discharged underneath the water either while the vessel is submerged or upon the surface. The only exposed part of the boat when not submerged is the conning tower, which is made of harveyized steel 24 in. in diameter and 4 in. thick.

MARINE REVIEW

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While the English have the courage of their race and flatly declare that they do not fear American competition, it is to be noted, nevertheless, that they are inquiring closely into the means whereby the United States has grown so great industrially. "What meat has this, our Cæsar fed on, etc.!" They have come to the conclusion that American methods must be adapted to English conditions. The English iron trade has not yet been seriously touched, and it is quite evident that they do not intend that it shall be. As an instance of the adoption of American practice, the pipe plant of the Sheepbridge Coal & Iron Co., Sheffield, is an illustrious example. It is of American pattern and is declared to be the finest in Great Britain. There is at present in this country a commission of Englishmen who are here for the sole purpose of ascertaining how the United States does things. They are the representatives of the British Iron Trade Association and their names are J. Stephen Jeans, Axel Sahlin and E. Parkes. Messrs. Sahlin and Jeans are in the great lakes district inquiring specifically into the mining and transportation of ore and coal, both by rail and water. One of the things which has impressed these men probably more than any other is the freedom with which they have been given access to all forms of information. No attempt has been made to withhold anything from them. They have been fairly deluged with working plans and drawings of machinery and plants. There are no secret processes in American manufacture. The great captains of industry with whom they have to come in contact know that the inseparable advantage of the United States lies in the abundance of raw materials and the cheapness of their assembly. The reports which these men will prepare upon American industrial conditions will probably be the most exhaustive that have ever been presented to the British Iron Trade Association. The data is being obtained by men of undoubted competence.

The United States is at present, indeed, the object of searching inquiry from Great Britain both in an industrial and economic sense. The remarkable speech which the late President McKinley made the day before he received his mortal wound, electrified the English nation. It was an intimation that the United States did not regard the protective tariff, in all things, desirable as a future policy. England is therefore watching McKinley's successor with great concern. President Roosevelt has said that he favors the abolition of such tariffs as are no longer needed for revenue purposes, if such abolition can be operated without harming American industries and labor. As no tariff can be levied that does not incidentally protect so no tariff can be removed that does not injure some individual branch of industry. It therefore remains to be seen whether the president was speaking of the country as a whole when he used the term "American industries and labor." Doubtless the country as a whole would now be benefited by extensive reciprocal relations. If the United States can make certain things more cheaply than Great Britain it is better for Great Britain to buy them and concentrate its energy upon producing those things which other nations cannot make as effectively. It conduces to the better distribution of human comforts if that country which produces most cheaply and most well is permitted to so produce. Humanity is the gainer thereby. If an acre of American soil will produce twenty bushels of wheat and an acre of English soil only five it is well for England to buy its wheat and to convert its farmers into mechanics. The Dakota agriculturist would then feed the English artisan and with the money thus obtained would be enabled to purchase a product of English manufacture—or, indeed, to discriminate among the manufactures of various nations. At any rate both of the two great divisions of society would be benefited by the transaction. A judicious reciprocal arrangement would undoubtedly enable the United States to produce many things more cheaply than it does now. It would be in better shape to compete for the markets of the world. If it wants to become a greater seller it must become a greater buyer. The two go hand in hand.

Apropos of the visit of the representatives of the British Iron Trade Association to this country to inquire into industrial conditions and processes of manufacture, some extracts from a leading article in a recent number of the London Iron and Coal Trades Review is timely. Under the heading "A Plea for Reform" British ironmasters are urged to keep abreast of the most advanced theory and practice of the times, to take care that others do not get ahead in their appliances, their processes and their mechanical systems. "This," says the journal, "is the alpha and omega of the whole business." The practical failure of British interests to do these things paves the way for our English contemporary to suggest that large profits and colossal fortunes are not made by selling dearer, but by being able to sell more cheaply than the rest of the trade. It denounces the old-fashioned and out-of-date methods and declares that Great Britain is crowded from end to end with more or less obsolete machinery. The British manufacturer has, no doubt, an extremely difficult problem to face. He was, in a vast number of cases, first in the field, and his foreign rivals have been able to go one better in following the lead which he has given. Pioneering, indeed, is not always profitable. Great Britain has suffered greatly from her share in the rudimentary advances of industry and civilization."

"British railways, canals, harbors and docks, mining and metallurgical industries," says the Iron and Coal Trades Review, "and many other essential factors in material prosperity would all have been more up-to-date and more effective instruments of wealth creation, had we come last upon the field, instead of having been the first. Others have reaped while we have sown. We have labored, and others have entered into our labors. It is little wonder that the British manufacturer remembers these facts with some bitterness when he hears American and German methods vaunted and his own decried. But if the facts be against him, he has to do what he can to meet them, and if he only meets them half way it were probably better that he did not attempt to meet them at all. Surely, if a machine or process by being entirely replaced can be made to produce better results by 100 per cent. it is much more sensible to follow that course than to temporize with the problems involved by modifications and expenditure that will only give improved results to the extent of say, 25 or even 50 per cent.

"What, then, is the British manufacturer to do? There are the usual three courses open to him—the first, to go on as he has done, which, in the end, must mean defeat and final expulsion from the world's markets; the second, to go half way to meet the new conditions, which a great many manufacturers have already done and many more are doing or proposing to do, and the third, to face the situation with boldness, enterprise and confidence, and determine that, whoever may come next, he will be among the first. Much pernicious and delusive stuff has recently been talked at the Iron and Steel Institute and other meetings as to the differences in conditions which justify British manufacturers in being behind the United States. The fact that many of our works are equipped with old machinery is put forward as an adequate plea for sticking to it and helping rivals to win the race. A certain baronet on Teeside, who has been a sort of mentor to the iron trade for a generation, quite recently offered a plea for this attitude, which appeared to be tacitly accepted by those whom he advised. We admit the hardship of the situation. It was also a hard thing to have to abandon thousands of pudding furnaces when the Bessemer and Siemens processes sounded the death knell of the finished iron industry. But the one thing is as inevitable as the other. If reform is aimed at it should be thorough—all in all, or not at all. We hope, therefore, that the majority of the undertakings that have been reaping exceptional profits in the last two years will not fail to look forward to a remodeling of many of their plants and the renewal of much of their machinery as work that has to be faced if they are to maintain in the future the not inglorious records of the past."

BRITISH SHIP BUILDING AT ITS MAXIMUM.

From the returns compiled by Lloyd's register of shipping it appears that, excluding warships, there were 477 vessels of 1,414,120 gross tons under construction in the United Kingdom at the close of the quarter ended Sept. 30, 1901. Compared with last quarter's return the present figures show an increase in the tonnage under construction of 105,000 tons. They are the highest on record. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1900 for the purpose of comparison:

Description.	Sept. 30, 1901.		Sept. 30, 1900.	
	No.	Gross tonnage.	No.	Gross tonnage.
STEAM.				
Steel	437	1,393,265	398	1,187,264
Iron	..	...	23	4,363
Wood and composite	3	200	2	785
Total	440	1,393,465	423	1,192,412
SAIL.				
Steel	18	18,698	9	9,280
Iron	..	...	..	...
Wood and composite	19	1,957	20	2,316
Total	37	20,655	29	11,596
Total Steam and Sail	477	1,414,120	452	1,204,008

The warships under construction in the United Kingdom at present for British account are forty-one of 353,670 tons and for foreign account nine of 21,375 tons, a total of fifty vessels of 375,045 tons.

Reference has been made in the daily newspapers at intervals in the past few months to the plans under way for a large blast furnace and coking plant to be built on a Cuyahoga river site in Cleveland. The project has not taken definite shape as yet, but most of the capital desired has been subscribed and land is under option. The original plan contemplated a blast furnace to make foundry and basic iron, and a by-product coke oven plant after the Otto-Hoffman type. Later proposals involve steel works. Among those prominent in the enterprise are members of several Cleveland iron ore firms, officers of the Union Rolling Mill Co., Wellman-Seaver Engineering Co. and the Lamson & Sessions Co., all of Cleveland. Another project that has good assurance of being put through contemplates the erection of a steel casting plant in Cleveland, especially for the production of small work.—Iron Trade Review.

For navigation charts apply to the Marine Review.

ANNUAL REPORT OF REAR ADMIRAL BOWLES.

The foremost item in the annual report of Rear Admiral A. T. Bowles, chief constructor of the navy, calls attention to the delays in the construction of ships now building, owing to strikes and non-delivery of armor and forgings. He points out that under the present system for the purchase of armor the responsibility for delays emanating from this source rests with the government, and renders it liable to suits for damages by the ship contractors. The construction bureau has made considerable progress toward the standardization of ship fittings, which, he says, will reduce the original cost of ships of the navy and decrease the expense of their maintenance. He touches upon the tests of fireproofed wood conducted by his bureau, and says that while the products of the two processes submitted will possess desirable qualities, neither wholly commends itself to adoption by the navy. Admiral Bowles strongly recommends that the floating dry dock at Havana, recently purchased from the Spanish government, be sent to the site of the new naval station at Olongapo, Philippine islands, as soon as the repairs on it are completed. It is essential for the efficiency of the navy on the Asiatic station, both from a strategical and economic standpoint, that the government shall be in possession of a dry dock in the Philippines at the earliest possible moment. The dock just purchased can be placed in condition for the use of vessels up to 10,000 tons displacement within the limit of the sum appropriated by congress for its requirement.

Admiral Bowles earnestly recommends an increase in the number of naval constructors, which is now limited by law to forty. This number is entirely inadequate to the present needs of the service, and he urges that the limit of the corps be increased by congress to sixty. He says that the efficiency of the navy yard plants throughout the country is largely limited by the insufficient number of dry docks and modern buildings for the equipment of the yards. The navy yards, however, continue to present a fruitful field for the application of modern engineering to their mechanical equipment as well as modern methods of organization to the scheme of administration, which, if properly applied, should result in greater efficiency in the conduct of work and great economy in the general expense, which is now out of proportion to the work done. The construction bureau has been taxed to its utmost capacity by the work of designing new vessels and supervising vessels now building, and that these conditions have been aggravated by a lack of space in the navy department building available for the technical and clerical staff of the bureau. He records a lack of draftsmen of the requisite qualifications and expresses a desire to obtain for the bureau more graduates of technical schools. He attaches much importance to the need of an efficient corps of carpenters in the navy as an adjunct to the corps of naval constructors. The number of carpenters now afloat is barely adequate to the needs of the service, and the number on shore duty is entirely inadequate. He points out that such employment means an honorable position on board ship, adequate pay and instruction while employed on shore duty, and he recommends that as soon as circumstances will permit, a school for the instruction of carpenters' mates be established.

REAR ADMIRAL O'NEIL'S REPORT.

The annual report of Rear Admiral Charles O'Neil, chief of the bureau of ordnance, was made public a few days ago. He submits estimates aggregating $10,902,606, of which $6,000,000 is for navy increase, armor and armament. He says:

"The latest types of guns are so great in weight and dimensions that it seems inadvisable to make any further increase in either respect, and increased efficiency must be looked for in the use of heavier projectiles and in the production of powder possessing higher ballistic properties." Regarding the new 7-in. gun, he remarks: "An experimental 7-in. gun of 45-calibre has been completed and proved. Its performance is considered highly satisfactory, a muzzle velocity of 3,000-ft. seconds having been attained with a projectile weighing 165 lbs. with a chamber pressure of 17 tons; weight of charge of smokeless powder, 74 lbs. This gun has a quick-working breech mechanism, similar in all respects to the 6-in. rapid firing gun, and is mounted on a pedestal mount, and can readily be pointed by one man. It has not yet been fired for rapidity, but soon will be. Probably still better results will be obtained when the exact size of powder has been developed."

The reference to smokeless powder is of some importance, the report saying: "Complete outfits of United States navy smokeless powder have been prepared for the New Orleans and Albany, to take the place of the cordite purchased with the ships. The bureau was led to take this action partly in deference to the views of a considerable number of officers of the navy, and partly because it was deemed preferable to adhere to the standard nitro-cellulose powder adopted for the United States navy. So far as the bureau was concerned, there was no doubt in its mind as to the safety of the cordite powders, though the bureau inclines to the belief that such powders deteriorate with age, are very susceptible to changes of temperature, which affect their efficiency, and are very destructive to the bores of guns."

Having in view the foregoing facts, the bureau is of the opinion that the 7-in. gun is well suited for the intermediate calibre in the proposed battleships, and is preferable to a mixed battery of 6-in. and 8-in. guns. As regards the armored cruisers, the board was unanimous in recommending a battery of four 10-in. guns in pairs in turrets, and of sixteen 6-in. 50-calibre quick-firing guns in casemates, with a secondary battery of twenty 3-in. (14-pounders) and twelve 3-pounders.

FLOATING DRY DOCK FOR MORAN BROS. CO.

The first section of what will be the finest floating dry dock of the Pacific northwest has been launched at the ship yard of Moran Bros. Co., Seattle, Wash. Hitherto all vessels of any size have been compelled to run to Quartermaster harbor when it became necessary to dock them, although, in some cases, the marine railway at the works of Moran Bros. has been utilized. The marine railway will be rebuilt as soon as the present dock is placed in operation, and will be known as dock No. 1, while the one just launched will be designated as No. 2. Work will be commenced immediately on a duplicate of the dock just completed. The two new docks can be connected in cases where large vessels are to be floated, or used separately in ordinary dockages.

In dimensions the dock is a large one, being 200 ft. long, 80 ft. wide, and the towers are 30 ft. in height above the pontoon, which is 12 ft. deep. The displacement of the structure is 2,000 tons, and its capacity is 3,000 tons. When coupled to the second section it will readily float the largest ship plying in Pacific waters. In its construction 1,500,000 ft. of lumber and 150 tons of iron were used, and every particle of material was produced in the yards. The dock has eighteen compartments, twelve in the main pontoon and six in the towers. From entirely original plans the machinery is so installed that any one compartment, or all, can be filled or emptied at one time. Six centrifugal pumps, operated by electric motors, supply the power. By an indicator system, devised by Robert Moran, the operator can tell at a glance the water level in any compartment.

An idea of the strength of the structure is formed from the constructive plans, which show that in the pontoon are a large number of transverse bulkheads, built of 12x12 in. timbers, 80 ft. in length, and a great number of longitudinal bulkheads and trusses. Vessels will be supported on cast-iron keel blocks, which in turn rest on a massive timber truss. The bilge blocks are also of the latest pattern, and are operated by modern appliances. The general scheme of the machinery, pumps, valves and indicators is entirely original. Under the direction of Robert Moran a machine was made that caulked the vessel by compressed air hammers, proving to be a great labor saving appliance. Drift bolts 4 ft. long were also sunk by air pressure, the appliance for which the ship builder invented. Unlike the launching of a vessel, care was particularly necessary in the floating of the dock from the ways that the surface strain at the bottom should be equalized, so that high tide was waited for to aid the calculations. In the 80-ft. wide structure it was necessary that a little more than half the bottom surface should be clear of the launching ways before striking the water. A trigger arrangement was placed beneath the center of the pontoon, and when the blocks had been knocked away a huge battering ram, manned by many men, struck the trigger free. With an even motion the huge dock, like an immense frame building, started forward, rapidly gathered momentum, and, with a final plunge, sprang clear of the ways and into the water. It floated across the canal, carrying a great wave in advance, and before it was checked carried down several piles as though they were but straws in its pathway.

FAST LINE BETWEEN MONTREAL AND GREAT BRITAIN.

Sir Christopher Furness, head of the steamship firm of Furness, Withy & Co., a few days ago gave out an interview in Montreal dealing with the long projected fast line between Great Britain and a Canadian port. He said that he and his associates had the funds in hand to proceed with the project, and that the sum required would be in the neighborhood of £2,500,000, but before he would be willing to go ahead, radical changes would have to be made in regard to the safety of the route. While in Montreal Sir Christopher Furness was in conference with Lord Strathcona. A fast line between Canadian and British ports has for years engrossed the attention of Strathcona, and he has remarked upon more than one occasion that sooner or later he was bound to see the scheme become a fact. Sir Christopher says that Lloyds must greatly enlarge its Canadian connection and that radical changes must be made in the lights, signals and pilotage system on the entire route. He declined to say what Canadian ports he had in view for the Canadian terminal of the line. He did say, however, that the bringing of such ships as it was proposed to build to Montreal was out of the question. Thus the matter is believed to rest between Quebec as a summer port, on the one hand, and Sydney, St. John or Halifax as winter or all the year around ports, on the other. On his return to England Sir Christopher will report his observations to his business associates and it is expected that they will proceed with the work of organization. Having completed his business in Montreal the English ship owner left the city for Sault Ste. Marie, to become the guest of F. H. Clergue.

DOES NOT FEAR AMERICAN COMPETITION.

Sir Christopher Furness of London, head of the Furness line of steamships, and chairman of the Weirdale and South Durham steel companies, visited Montreal last week. He is making a tour of inspection of the ship building yards and steel, iron and coal industries of Canada. Experts have already gone over the ground and reported to him as he is now making a personal inspection. In company with Sir William Van Horne, Mr. H. M. Whitney and others he will visit the works of the Dominion Iron & Steel Co., Sydney, N. S. After that he will make a trip over the Canadian Pacific, inspecting the mineral industries and wealth of British Columbia. The trip may possibly be extended to the gulf of Mexico. Sir Christopher said:

"America will never send us much steel, but I regard her competition for the world trade as somewhat serious for England in those countries where we have so long had a monopoly. At present American steel may perhaps be carried to England more cheaply than it can be produced there, but later this will be an impossibility, as English steel makers are improving their machinery in accordance with modern requirements. We have cheaper methods of treating the ores, using coke entirely, and are waking up and making a general reorganization of these methods. Very shortly we will be able to produce it as cheaply as it is made in the United States."

The steamer Siberia, just launched from the yard of the Newport News Ship Building & Dry Dock Co., Newport News, Va., as well as her sister-ship the Korea, now nearing completion at the same yard for the Pacific Mail Steamship Co., have the feed water circulator and steam heating attachment manufactured by H. Bloomsburg & Co., 112 Thirty-fifth street, Newport News, Va., fitted to all their boilers complete, there being fourteen sets of the apparatus required for each ship. This company has also furnished recently circulators for the steamer Henry Steinbrenner, built for the Kinsman Transportation Co. of Cleveland by the Jenks Ship Building Co., Port Huron, Mich.; also the steamer Kennebec, built some time ago by the same company. The Newport News company furnished similar apparatus for the two ferryboats for the Central Railway of New Jersey, built by the Harlan & Hollingsworth Co., Wilmington, Del., and also for the steamer Springfield, just launched by the Pusey & Jones Co., Wilmington, Del. All the new lightships and lighthouse tenders for the United States Lighthouse Board are equipped with this apparatus.

ADMIRAL MELVILLE'S ANNUAL REPORT.

AS USUAL IT IS A FEARLESS DOCUMENT—HE POINTS OUT THE GRAVE DANGERS TO THE ENGINEER CORPS.

That there has been retrogression rather than advance along engineering lines in the navy during the past two years is the most significant statement contained in the annual report of Rear Admiral George Wallace Melville, engineer-in-chief of the navy. He devotes the longest chapter in his report to a statement of the evils of the present and suggestions for improvement in the future. He says that this is not the time to entertain the suggestion that is frequently made that a separate engineer corps should again be created. But he believes that a more liberal and different interpretation of the personnel law will do much to meet the needs of the engineering service.

"Ever since the passage of the personnel bill," says Admiral Melville, "I have contended that the measure of success to be secured from the law would be altogether dependent upon the manner in which it was interpreted. It was certainly the expectation of the congress, and also of the personnel board, that the status of engineering in the navy would be advanced by this law. In fact, the controlling influence which made possible the passage of the bill was expressed by the then Assistant Secretary Roosevelt in his report to you upon the subject, when he stated that 'every officer on a modern war vessel has to be a fighting engineer.' This statement so succinctly stated the fact that it received the widest approval as soon as it was published. The reason for its ready acceptance was because thoughtful men had for a considerable time previous recognized the present as an age of engineering. Particularly in respect to naval matters had the public at large come to the conclusion that the modern battleship is a floating fort, filled with complex machines, whose efficient care and maintenance can only be intrusted to a trained mechanical force, and the best efforts of this force can only be obtained when directed by trained officers. This applies to every department of the ship, and is only more applicable to the engineer department because that department comprises not only the most important but the greatest number of mechanical appliances.

"I am simply stating a fact when I assert that the number of trained and expert engineers in the navy is being steadily reduced. The practical working of the amalgamation scheme thus far has been, in great part, to take the junior half of the old engineer corps and transfer them to line duties. Individual officers of the old line have conscientiously striven to perfect themselves in engineering duties, but up to the present time no systematic measures have been taken to train officers for the engineering needs of the future. The work is too important and the needs of the future too great to depend upon individual effort to secure sufficiently numerous and trained officers for such duties. Herein has been the radical weakness of the system that has been pursued since the passage of the bill. As a result of this inadequate supervision in the engine rooms there has been a perceptible decrease in the efficiency of the machinery and a progressive increase in the cost of repairs. Definite data upon this question are difficult to secure, since this retrogression is progressive in character, and the full extent of the evil cannot be determined without searching investigation. The condition of the machinery of the torpedo boat flotilla shows the trend of affairs.

TORPEDO BOATS FREQUENTLY DISABLED.

"During the past year the disablement of torpedo boats has been of such frequent occurrence that the majority of the boats have been under repair a great part of the time. Many of these mishaps are serious in character, and the present condition of the flotilla affords an incontrovertible argument in favor of the proposition that practical engineering ability of high order is required for their successful care and operation. In my opinion, the machinery of the torpedo boat craft would not be in its deplorable condition if engineer officers of experience had been detailed for supervisory duty in connection with the boats. It is strikingly significant that the decrease in machinery efficiency has been most marked in the case of the torpedo boats. With this type of craft it has been attempted to practically maintain the machinery in operation without the supervision of trained engineer officers. With such a system in operation it is not surprising that inefficiency should be the rule. Upon official trials the builders of such boats find it necessary to fill the engine rooms with supervising engineers of ability and experience, who command high salaries. After such boats are turned over to the government it cannot be expected that an insufficient and unskilled force will be capable of operating them. The depreciation of the boats will take place at a rapid rate if either an inadequate or inefficient personnel is to be intrusted with their care and maintenance.

"That efficiency beneath the protective deck is no less important in naval warfare than efficiency above it cannot be doubted. The boiler plant is the heart of the vessel, and any weakness in that direction will be followed by general decline everywhere else. The difference between an efficient and inefficient force on board a warship was shown at the battle of Santiago. The crowning act of that victory was the overtaking of the Colon by the Oregon. In this chase a battleship of 16 knots speed, manned by an efficient engine-room force, overtook a 20-knot armored cruiser whose motive power was inefficiently handled, since only about one-half the boiler power was developed on board the Colon that could have been secured by a skilled force of mechanics and firemen directed by a trained and educated complement of engineer officers. The bureau has reason to eventually expect service from the young line officers sent to engineering duty if such junior officers are made to understand that promotion only awaits those who qualify in this direction. The greatest good that must come from such details will be manifest in the future. It cannot be expected that immediate results will be secured from this change in the future engineering training of the naval personnel. Satisfactory progress can only be secured by development. The experience of the cadet engineer system, whose abolishment cannot be too deeply regretted, showed that a perfected system of training engineer officers could only be secured by progressive experience and observation. Although the system was established at the naval academy in 1866, it was fifteen years from that time before a satisfactory course of instruction had been outlined that was in keeping with the needs of the service. It will require time also to perfect the present system.

THE ADMIRAL SUGGESTS A REMEDY.

"As the paramount purpose of these details must be to secure an engineering personnel for the future I strongly advise that a large contingent of the junior officers be sent to the various navy yards and to other stations where engineering instructions and experience can be secured. These junior officers should be detailed for engineering work exclusively. If additional duty is assigned by other bureaus it cannot be expected that competent officers for engineering work can be adequately trained. This is not a question of specializing along engineering lines. It is rather a question of preventing inefficiency and demoralization existing in the future. Those undertaking this work must be impressed with the fact that there are unpleasant as well as attractive features in qualifying along every line of work. Any system of training which will permit the unattractive and difficult features to be avoided will make for future inefficiency.

"When the personnel law went into effect we had an engineering corps that it was recognized as the equal, if not the superior, of that possessed by any other naval power. This efficiency was secured because the junior officers of the old engineer corps had been taught the lesson that to attain success much disagreeable work had to be done and many unpleasant duties performed. Those who are to succeed to the duties of the old engineer officers must be taught the same lesson of interesting themselves in the difficult as well as the attractive work of the profession. The deep-seated prejudice that existed in the navy against engineering duties has not altogether been eradicated, and from this cause, it will be a difficult matter to create the interest and enthusiasm in this work that can be secured from more congenial and conspicuous assignments. It may not require much persuasion to induce many junior officers to acquire a superficial knowledge of engineering principles. It will need determined action, however, to compel a number sufficient for the engineering needs of the future to qualify to a degree that will make them proficiently capable of performing this important duty. The success achieved in the past cannot be repeated unless the same pride and interest in engineering work is taken by those detailed in the future to this duty. The necessity for looking ahead being recognized, the practical problem arises as to what details of policy are essential for such success."

PLEA FOR EXPERIMENTAL WORK.

Admiral Melville advises that a large number of junior officers be sent to the navy yards for practical engineering training; that a post graduate engineering course be established at Annapolis; that stokers be especially trained; that torpedo boats be used to train machinists and water tenders; that naval machinists be given special instructions on repair work at navy yards; that deserving naval machinists, after twenty years service, be given navy yard duty; that warrant machinists be placed on the same footing as other warrant officers, and that special pay be allowed water tenders of torpedo boats. The engineer-in-chief asks for a new building at Annapolis and an appropriation of $150,000 for experimental work, which he regards as of incalculable value to the government. He wants the best liquid fuel and the steam turbine and electricity as a prime mover, including the storage battery. There is also need of investigation into the best water-tube boilers; the causes of corrosion of boiler tubes, the availability of compressed air as a motor, and of the gas engine, and many other engineering problems of great importance, which could be approached in this experimental laboratory, which might also be made available for use by mechanics and inventors not financially able otherwise to test their inventions. The chief engineer declares that the wonderful strides made by Germany in the last ten years can be in great part ascribed to the Charlottenburg experimental station.

DEATH OF REAR ADMIRAL BUNCE.

Rear Admiral Francis M. Bunce, retired, died last Friday at his home at Hartford, Conn. He was born Dec. 25, 1836, at Hartford and graduated from the United States Naval Academy in 1857 and became a lieutenant in 1861. His promotion to the rank of lieutenant-commander followed two years later and thence he was promoted to the office of commander. His rise was gradual. He was made a captain in 1883, a commodore in 1895 and rear admiral in 1898. During the civil war he was executive officer of the Penobscot in 1862 and was engaged in the blockading service off Wilmington, N. C. He took part in the various boat expeditions and skirmishes, served in the Pawnee and had charge of the naval part of the attack and capture of Morris' island, S. C. He was wounded in the siege of Charleston. After the close of the war he took the monitor Monadnock from Philadelphia to San Francisco. This was the first extended sea voyage ever made by the monitor. At various times since he has been stationed at the naval training station, Newport, R. I.; North Atlantic station, and the navy yard, New York. His father was James Marvin Bunce, and he married Mary E. Bull in 1864.

CAREER OF THE OLD STATE OF MICHIGAN.

The old steamer State of Michigan, which went down off White Lake last Friday, was built at Manitowoc in 1873 for the Goodrich line, and originally bore the name Depere. After having served in the line until speedier and larger boats became a necessity, she was sold to Stephen B. Grummond and it was then that her name underwent a change. Capt. Grummond also had her rebuilt and substituted a powerful engine from a dismantled tug for the two small engines which she carried. She was profitably employed for some years between Detroit, Mackinaw City and intermediate ports and afterward ran for a short time between Detroit and Cleveland in opposition to the old established line. The failure of this move caused her to be laid up and thrown upon the market for a purchaser, and it was then that she passed into the hands of the Barrys of Chicago. During her existence the lost steamer was stranded twice—once while in the Goodrich line near Manitowoc, where she spent an entire winter on the beach, and later while in the Grummond line on the Charities in Saginaw bay, where she came near being abandoned as a total loss.

Capt. Charles Barr, skipper of the Columbia, which successfully defended the America's cup, is a Gourock, Scotland, man. He was originally apprenticed to Messrs. McLymon, the well-known Greenock grocers, but the success of his brother John as a yachtsman induced him to follow his example.

TRIAL TRIP WITH LIQUID FUEL-BURNING APPARATUS.

The Trocas, one of the Shell Trading & Transport line vessels, equipped with liquid fuel-burning apparatus, was given a trial trip recently of great interest. The trial took place off the mouth of the Tyne and was attended by about eighty of the leading ship owners and ship builders. There were also present representatives from the two great German lines, Hamburg-American and North German Lloyd, as well as several engineers from the admiralty and representatives of Lloyd's register and Bureau Veritas. The apparatus with which the Trocas is furnished consists of pumping and filling arrangements for converting the fore and after peaks, the fore and after cofferdams, and the ballast tanks underneath the engines and boilers, into liquid fuel tanks, thus turning to account spaces hitherto quite useless either for cargo or bunkers, and making them serve for the storage of the vessel's fuel, leaving free for other purposes, if required, the ordinary coal bunker space. In the Trocas, which is an oil tank steamer as well as a general cargo vessel upon the system peculiar to Messrs. Samuel's Shell line steamers, it will be when carrying general cargoes homewards from the east that the additional space will be most valuable; but in the case of vessels always carrying general goods a portion at least of the bunker space will be available for cargo when the ballast tanks and peaks are utilized for storing the fuel. The visitors were shown a large scale drawing placed in a conspicuous position on the deck of the steamer, of all her machinery, including sections of the boilers and furnaces, and including also sectional drawings of the sprinklers or burners, and actual samples of the burners themselves. The liquid fuel apparatus for filling and emptying the peaks, ballast tanks, and cofferdams is simple and obvious. Turning now to the furnaces, their appearance does not differ very materially from the ordinary arrangement of furnaces for burning coal. The fire bars are left in place and are the same. The bridge of firebrick at the end of the furnace is in the same position, but is somewhat more heavily bricked, and the additional interior arrangements of the furnace appear to consist of an arch of firebrick immediately over the bridge, and a lining of firebrick at the back of the combustion chamber extending about as high as the middle row of tubes, and intended to receive the impact of the flame as it rushes through the furnace under the impetus of the steam and oil jets. These jets are produced by two tubular injectors, each of about 1½ in. internal diameter, with annular openings adjustable by ordinary hand wheels on the Rusden and Eeles' system for the steam and oil, the inrush of the steam breaking up the oil into particles like rain, and facilitating its immediate conversion into flame. The fire bars are protected against the strong heat by having broken firebrick upon them to a depth of 6 or 8 in. The furnace fronts and the fire doors are very similar to those of ordinary pattern, excepting that there are three circular holes in each front, two for the reception of the injectors, and one a sight and air hole. The injectors themselves swing upon jointed pivots, admitting of the passage through them of the steam and oil as required.

The liquid fuel is pumped from the main receptacles already mentioned to settling tanks which are placed in the 'tween-decks some 20 ft. or more above the level of the fires. These settling tanks are disposed upon the patented arrangement known as the Flannery-Boyd system, in which they are capable of alternate use or of assisting each other in separating water from the oil before it is allowed to enter the furnace. The liquid fuel, after being pumped into these receptacles by pumps in the stokehole, and after being freed from any water, is allowed to fill by gravity through pipes to the swivel-jointed injectors already described, and the action is complete. The whole apparatus is remarkable for its simplicity, and was pronounced by all the engineers on board to be freer from complication and multiplicity of parts than anything which had previously been seen, although some fifty steamers have been fitted with liquid fuel apparatus by the Wallsend Slipway & Engineering Co., which executed the contract on the Trocas, and although there are many other steamers running with liquid fuel apparatus which have been fitted by other engineering firms.

The trial was more of a demonstration than a scientific experiment to ascertain data, the time allowed being much too short for any reliable figures to be obtained. The vessel got under way at 12:30 p. m., and steamed until 3 p. m. at ordinary voyage speed of about 9½ knots, making 9.9 knots on the measured mile. At 3 o'clock the visitors were invited to specially enter the stokehole for the purpose of witnessing the ease with which the fuel apparatus could be changed to coal burning. The forward boiler—there are three boilers in the Trocas, each with three furnaces—was first taken in hand, the flame being put out by simply closing the valves, the firebrick which had hitherto protected the bars being raked into the stokehold, coal being then laid upon the bars without the usual preparation of chips and shavings. The fire doors were immediately closed, the oil and steam again turned on and lit for the purpose of, in their turn, igniting the coal.

The first boiler was steaming under way with coal in 9½ minutes from the time it had been shut off from steaming under oil. The same process was applied to the other two boilers in their turn, and the vessel was continuing her way under coal in just half an hour from the time she temporarily ceased to be steaming on oil. The engines were not stopped, but were slowed down from about sixty to fifty revolutions, and the simplicity of the apparatus was still further demonstrated and admitted by the scientific gentlemen who were present. Whilst the vessel was under oil the flame was observed to be very clear and intensely hot, and of course of almost absolute steadiness, the steam not varying but being so plentiful that the safety valves blew off from time to time. There seemed little doubt that there was power enough in the boilers to enable one boiler to be laid off and the engines to be driven at their ordinary speed by the two remaining boilers.

After luncheon some speeches were made, Mr. Boyd stating that the ease and rapid change from liquid fuel to coal and vice versa was a desideratum which, being hitherto not very clearly demonstrated, had prevented many steamers, whose employment would for market reasons be on the two different kinds of fuel alternately, from adopting the new method, and that the principal object of his firm in that day's trial was to show that such an objection could no longer exist. Sir Fortescue Flannery, M. P., proposed success to the Wallsend Slipway & Engineering Co., and stated that the Trocas was the eighteenth steamer belonging to Messrs. M. Samuel & Co. fitted for burning liquid fuel, and that the apparatus was becoming simpler with each succeeding vessel. He mentioned also that the depots for oil fuel which Messrs. M. Samuel & Co. had constructed at Suez, Colombo, Bombay, Calcutta, Singapore, Hong Kong, and the China and Japan ports, appeared to be all that was necessary to ensure a regular supply of the fuel east of the Suez canal, and in those regions which the oil reached by short transport, and which the coal reached after long transport, the oil would necessarily have a marked advantage over the coal, to an extent greater than could be expected to exist in the western hemisphere with coal-bearing regions in the immediate vicinity. That was the state of things until the discovery of the Texas oil fields had revolutionized the situation, and if the statements that were brought to them from Texas were even partially realized they would receive from that source such an inexhaustible supply of liquid fuel as to render its use an easy and regular method of propulsion in the British merchant navy. Regularity of supply was of the utmost importance, but even in the possibility of that regularity being interrupted they had demonstrated that day the facility with which any ship skilfully adapted could accommodate herself to the most favorable market supply either of one fuel or the other. The enterprise of Sir Marcus Samuel had demonstrated some years ago the possibility of carrying fine goods alternately with petroleum in the same steamer, and it was the same spirit of enterprise which had induced the Shell line to take the lead in the burning of liquid fuel, many of its vessels being regularly engaged on service in the China seas upon that fuel, one of them, the Cowrie, having crossed the Atlantic and entered New York, steaming under Borneo oil. The obvious advantages to ship owners of utilizing bunker space for cargo, of reducing the number of stokers, and of avoiding detention when taking in oil instead of coal were, he said, so great as to outweigh the disadvantages incidental to novelty and the higher price per ton at which liquid fuel must necessarily stand as compared with some of the cheap mixtures of coal of which some of his ship owning friends were so fond. The economies had been clearly demonstrated, and the endurance was also demonstrated, the Volute, a sister vessel to the Trocas, having already completed over 40,000 miles on liquid fuel without a hitch or trouble of any kind, other vessels of the Shell fleet having had similar experience.

BRITISH TORPEDO BOATS DENOUNCED AS TINPOTS.

Referring to the British admiralty's new type of battleships to be known as the Edward VII class, the Cologne Gazette discusses the question as to whether Germany should imitate England in building this type of a monster iron-clad, which will undoubtedly be more formidable than its predecessors by reason of its heavier armament. The Gazette finds the answer in the necessity under which Germany labors in having to build ships of dimensions and draught which will enable them to enter harbors like Wilhelmshaven and Kiel and, above all, to pass through the locks of the Baltic canal. Germany, therefore, cannot have ships of more than 13,000 tons displacement. For that reason she is obliged to build ships of one type and one strength. The Gazette goes on to argue that there are many reasons for assuming that a squadron of this kind would be superior in battle to a fleet of vessels of various types, even if some iron-clad monsters were included. Another consideration is that these enormous vessels could not be formidable opponents everywhere. The Gazette says: "Assuming that our soundings in the North sea and the Baltic are correct, the ability of such vast ships to maneuver would be limited in those waters."

The London Times points out that these reflections of the Cologne Gazette possesses a certain political interest as they reveal the considerations which constantly are uppermost in the minds of German naval authorities. The latter must have found the comments of English newspapers on the verdict of the court-martial into the loss of the torpedo boat destroyer Cobra very pleasant reading. All indorse the rebuke of the admiralty for purchasing the Cobra. It is generally stated that the admiralty's parsimonious treatment of the contractors is responsible to a great extent for the recent series of mishaps to the torpedo boat destroyers. These mishaps alone have been serious enough to cause the uneasiness which unquestionably exists in British naval circles with regard to the destroyer fleet, which the sailors have nicknamed tinpots, but if the statistics of the daily life of these delicate vessels were published the public would be staggered. Every destroyer, according to the official regulations, has a week for repairs after a cruise in the fairest weather. Moreover, when no special mishap has occurred a week is always required, but the repairs needed which are not allowed for, and which are looked upon so complacently by the officials, are far greater. Out of a fleet of some 113 torpedo boat destroyers it has been stated publicly again and again this week that over 30 per cent. are always laid up and unfit for service, while many of the others are more or less crippled. Charles Parsons' statement before the court in regard to the destroyers, in which he said they were merely fair weather craft, has aroused a storm of criticism. The Times, in an editorial on the subject, says: "That torpedo boat destroyers can be built to behave as ocean-going ships has been proved by the fact that the British-built destroyers have gone to Japan on their own bottoms although they encountered heavy weather on the way."

The reference to the British-built destroyers for Japan touches the admiralty's chief mistake. The firm which built many of Japan's destroyers, practically sends its whole output abroad for the simple reason that the terms and conditions of the British admiralty cannot be complied with if similar vessels are to be supplied.

Of the companies which issue excellently printed catalogues few excel the B. F. Sturtevant Co., Boston, Mass. Catalogue No. 117 is no exception to the list. This company established the first blower manufactory in the United States forty years ago. Ten years ago the rapid increase in the use of electricity as a motive power opened the way for the electric fan with motor and fan built the one for the other. The Sturtevant company established an electrical department, designed a full line of fan motors and thus gave the purchaser the opportunity to choose between an engine-driven and a motor-driven fan. Today the company has patterns for over 100 sizes and types of engines, ranging from 2 to 250 H.P. and a record of over 8,000 engines sold. In its various motor designs it is likewise equipped with an equal variety. A corresponding line of generators is also built by utilizing the essential parts of these motors. Both engines and motors have been developed under the exacting conditions incident to fan practice, namely, high speed and constant operation.

GRAIN TRADE OF THE NORTHWEST.

MR. F. H. PEAVEY IN AN INTENSELY INTERESTING ADDRESS REVIEWS THE HISTORY OF THE INDUSTRY FROM ITS HUMBLE BEGINNING TO ITS PRESENT MAMMOTH PROPORTIONS.

At the recent meeting of the National Grain Dealers' Association at Des Moines, Iowa, Mr. F. H. Peavey of Minneapolis read a paper of most absorbing interest upon "The Grain Trade of the Northwest." Probably no man is better qualified to speak upon this subject than Mr. Peavey, whose whole life has been identified with the storage and transportation of grain. His address contains many facts of historical interest, and shows in a most comprehensive manner the wonderful revolution which has taken place in the grain trade during the past twenty-five years. He said:

"I am especially pleased that our meeting should be in the good old state of Iowa—the state to which I immigrated from Maine way back in 1867, locating then in the northwest corner of the state at Sioux City, which at that time was 100 miles beyond a railroad. The journey from Chicago to Sioux City required three days and three nights. There is therefore a very large, warm spot in my heart for everything that pertains to the interests of this great and glorious state—and there is no greater state in this union of ours. When I travel, as I frequently do, through the northwest counties, I always enjoy sitting in the rear car of the train and reminiscing, going back to the old days when some of those counties were first settled—counties that are now large in population and settled by the best class of people, who have become wealthy and influential in the affairs of the state and the nation. I was sidetracked in Sioux City for 18 years; thence going to my present home in Minneapolis. The subject on which I have been asked to talk 'The Growth of the Grain Trade of the Northwest' gives me a great scope, and for its complete treatment would require a large volume, as few people even in the grain trade itself have a realizing sense of the enormous growth of the grain business in this country during the past decade. I will give you briefly my observations and experiences covering a period of thirty years, when one firm that I recall started in a feed store with less than a carload of assorted grain, and today this same firm, which has never changed its name, controls and practically owns elevators scattered throughout the country of an aggregate storage capacity of 38,000,000 bushels.

"I first chanced to think how wheat was handled in Sioux City, Iowa, in 1867 (that section which now boasts of its magnificent corn crop and has its corn palaces, was supposed to be beyond the corn belt at the time I mention). In those days the aggregate wheat receipts were small, although the entire country to the west was tributary. Farmers delivered the grain in sacks and the grain merchant used his back to convey the wheat to one corner of the warehouse; later it was re-sacked and carted to a Missouri river steamboat and shipped to Omaha, the then nearest railroad point. The small volume of business; uncertainty as to time of delivery; the necessity of using muscle in place of machinery; the lack of being able to hedge, all contributed to force the merchant to buy on a very wide margin, or to gamble that wheat would advance in price. The large majority of those who pursued the latter course died poor, or are today without money or influence.

"With the advent of the railroad came partitioned warehouses, and those among you old in the business will recall how we fought for hill or knoll locations high enough to spout to cars without rehandling. Later came the balloon elevator driven by one blind horse with a fanning mill in the basement. Some of you will remember alternating between the mill and the horse, using the same stick for both. What are now known as line elevator companies had their origin in the early seventies, and one of the first was located on the Dakota Southern railroad from Sioux City to Yankton, a distance of 65 miles (one of the first roads to invade Dakota), now known as a branch of the C., M. & St. P. Ry. With the advent of the St. Paul & Pacific road (now known as the Great Northern) and the Northern Pacific, and the tremendous immigration following the line elevator man became a necessity. Material was carted miles in advance of the railroad, and at heavy expense elevators were completed by the time the tracks reached there. Business was commenced with no banking facilities and in many cases with no other building in sight; wheat receipts were heavy; steam power was used; currency was shipped from Minneapolis to the nearest express point and then sent by special messenger to the side track elevator man, whose life was lonely and whose pistol was ready to protect the money and property in his charge. About the same period the St. Paul & Sioux City road (now known as the Omaha) was completed and established an elevator line of its own, all charges being included in the freight, thus preventing competition. Their houses would handle 6,000 to 8,000 bushels of wheat per day, and were operated by steam with two unloading places. I have known farmers at Sibley (and I remember when the first man settled in Osceola county), and later at Luverne, Minnesota, to wait twenty-four hours and even longer to be unloaded. A line would be formed, horses or oxen unhitched and farmers would attend to their own wants; about once an hour or so all those in line would return with their horses, hitch and draw up, and this process would be continued until each team arrived at the elevator was unloaded. This method of handling elevators did not prove successful to the railroad company, who sold or leased them to other parties and confined themselves to their legitimate business of transportation.

"Today through the agricultural districts the grain buyer is usually located in advance of the railway agent, his elevator being completed before the station house is ready; as the country becomes more densely populated new towns spring up and new side tracks are put in, and hence we have a steady increase in country elevators, and in most cases the new houses are built of cribbing and operated by gasoline power. Through the older states the houses are owned by the independent buyer; in the northwest the line elevator men predominate. While the increase in the number of country elevators has been very rapid, the growth of the terminal elevator is still more marvelous. Terminal elevators are a necessity to transportation and commerce; they are the reservoirs which carry the product of the country until the grain is wanted for home or foreign consumption. It is impossible for the consumer to take the grain as fast as the producer rushes it to market, especially in the fall, and if it were not for the terminal elevators, backed by large capital and credit, cereal prices would be very greatly depressed. The necessity for the terminal elevators is most apparent to all thinking men. Large terminals are now contemplated or are under construction in New York, Boston and New Orleans, in the United States; and in Quebec, Montreal and Port Arthur, in the Dominion of Canada. When terminal elevators were first constructed they did not run over 300,000 to 500,000 bushels capacity. One firm tore down an elevator the other day in Minneapolis that cost $60,000; didn't pay to run it, for it costs but little more to operate a 3,000,000 bushel plant. Those first terminal elevators were built of wood, with all the bins about 20 ft. above the main floor, and all belts running perpendicularly; the houses cost about 30 cents per bushel capacity according to the kind and amount of machinery used. It was soon discovered that annexes could be utilized, and they were constructed of cribbing with bins running to within a few feet of the ground. These annexes were used for storage purposes alone; bins were flat bottomed and were loaded and unloaded by conveyors from the working house; at first the old spiral screw conveyor was used; later the rubber belt, at first concave, but now perfectly flat. I think the longest single elevator belt in use is in one of the houses in Minneapolis—1,200 ft. long. We adopted the horizontal belt system after I had personally investigated its advantages in Liverpool and London. The driving belt in all modern elevators has been superseded by the rope.

THE CEMENT GRAIN ELEVATOR.

"You will pardon me for being somewhat personal, but I have always aimed to keep abreast of elevator improvements, and ten years ago my firm became interested in the building of a system of three elevators in West Superior, Wis., of a total storage capacity of 5,000,000 bushels. The working house of 1,000,000 bushels capacity was located on the dock and the other two houses running lengthwise were connected by steel galleries, the three houses being placed 450 ft. apart. We had previously lost heavily through fire by the use of wooden galleries and were at the mercy of the insurance companies, rates having become oppressive, and in addition there was not enough insurance in the country to go around when wheat was high-priced, and with the transfer rates cut from 1¼ cents to ½ cent per bushel it became imperative to adopt such improvement as would reduce the rates of insurance on grain. Mr. James J. Hill built in Buffalo the first steel elevator and it proved a success; he later built one in West Superior. Minneapolis has two and Chicago one. About two years ago the hollow tile tank system for storage was successfully adopted by some elevator companies. My firm was not entirely satisfied with either plan. We sought a material for elevator construction that would be absolutely fireproof, one that would grow stronger with age, would not require paint or repairs, and we decided upon the use of cement, and are now just about completing a plant in Duluth costing between $750,000 and $1,000,000 that I believe to be the most complete and up to date elevator plant in the world. Men have come from Liverpool, Montreal, New York and elsewhere to investigate this system of construction and we have had letters of inquiry from Buenos Ayres. In adopting the cement system of construction we did not act hastily, but made an exhaustive and intelligent investigation. We first noticed that the railway companies were using cement instead of stone for bridge work, and three years ago we quietly erected a circular tank 114 ft. high and 25 ft. in diameter, having an average thickness of 8 in. as a test, and had it full of wheat from early fall until late spring (and most of the time since then it has been full of wheat), when the wheat came out dry and sweet. The following fall one of my partners, accompanied by an expert, spent three months in Europe visiting Denmark, Germany and France, and went as far north as Russia, noting and investigating all structures built wholly or partly of cement. At Braila in Roumania a large elevator was found, owned and successfully operated by the government, built wholly of cement. Braila is situated on the Danube river, 30 miles from the Black sea, and handles about 70,000,000 bushels of grain annually. Another member of my firm visited Italy and examined the cement used in the Colisseums in Naples and Rome over 2,000 years ago. I give you these details that you may know we spent time and money before arriving at a conlusion. Our Duluth plant has a capacity of 5,000,000 bushels—1,000,000 in the wooden working house and 4,000,000 in cement cylindrical tanks, each 104 ft. high and 35 ft. in diameter, these tanks being located 50 ft. from the working house, and connected by five conveyors, each capable of carrying 20,000 bushels per hour. About one-third of the cement part of this plant was completed last fall and in that part we carried 1,000,000 bushels of wheat all winter and spring without insurance, and we shall not carry any insurance on building or contents. We are justly proud of our undertaking, believing it to be in advance of any known elevator construction.

"The most phenomenal growth of the grain business has occurred in the northwest with Minneapolis and Duluth as terminals. When we commenced doing business through Duluth the elevator capacity of that city was 350,000 bushels; today it has a capacity of 32,000,000 bushels. Minneapolis in 1880 had an elevator capacity of 1,000,000; in 1901 its elevator capacity is 33,000,000 bushels. Diverging a little it may interest you to note the immense growth of the grain option or speculative business in the northwest. Citing Minneapolis alone, the first pit was put in on the floor about 14 years ago; afterward it was taken out on account of no business; a couple of years later it was again tried and succeeded, and since that time has grown to very large proportions. Last year the trades averaged nearly 8,000,000 bushels per day of wheat alone. The largest trade of any one day was 24,000,000 bushels of wheat—dizzy figures and practically the growth of ten years. In the old times we have paid 20 cents per bushel freight charges on wheat from Duluth to Buffalo; today we regard a 2 cent rate excessive, and have shipped wheat for ¾ of a cent. In 1885 the all-rail rate from Fargo to the seaboard on wheat was 39 cents per bushel and this fall the rate has been 21 cents per bushel. In other words, the producer at Fargo can ship his grain to the seaboard and sell it for 18 cents less than he did in 1885 and still realize as much money. In the old days the capacity of a freight car was 20,000 lbs. Today it is 80,000 lbs. Twenty years ago the ship on the great lakes carrying 30,000 bushels of wheat was regarded of large capacity; ships of today will carry 250,000 to 275,000 bushels each. In those old times it took all day to load a small vessel with wheat; today there are elevators at Duluth that can load 150,000 bushels per hour into a steamship. Twenty-five years ago there was little or no corn raised north of Sioux City. Today in the state of Minnesota the corn crop amounts to 40,000,000 bushels. In 1876 the receipts of grain at Minneapolis were 5,185,000; in 1898 they were 116,096,160.

GRAIN TRADE IN THE PACIFIC NORTHWEST.

"My firm was first to build elevators on the Pacific coast—building in 1889 and 1890 under the name of the Pacific Coast Elevator Co. a 1,000,000 bushel elevator at Portland, Ore., and fifty country elevators in Oregon,

Washington and Idaho, and it may interest you to know how the business is done there compared with the methods in vogue on this side of the Rockies. The Pacific coast grain elevator business entails more risk than that of this section of the country. I speak more particularly with regard to the Pacific northwest. Warehouses are still most generally in use; farmers do not sell by the wagonload, but usually haul their entire crop to market in sacks, and, with others, pile it outdoors on dealers' platforms many tiers high. Each owner has his private mark on his sacks, and will not permit his grain to be mixed with that of his neighbors, for each man knows he has raised the best quality (the buyer can only sample the wheat by plugging). Sometimes the wheat will remain piled in the way mentioned for a month or more; frequently the farmers will pool their holdings and auction off the whole lot, advertising the fact in advance. Sacks must be bought with the wheat. The first strife among buyers is to secure the wheat for their own platforms, for each buyer receives the handling charge in case others should ultimately purchase it. Buyers work for this preference from early spring, loaning sacks, selling them on time, making advances on the crop—anything to get there. The grain is shipped in sacks to the seaboard and is there trucked to and piled up in a warehouse in piles seven sacks high; it is thence loaded into sailing vessels for a four months' voyage to Europe around Cape Horn. Most cargoes, not sold in advance, are billed to Cork, Ireland, for orders. Early in the crop year samples are gathered of Walla Walla valley and Palouse valley wheat, and by mixing them together, or by taking each valley by itself, one is supposed to secure a fair average quality of the crop. Samples of the same are sent to different European markets, and hence the speculative grade is known as the f. a. q. grade. France likes light bread, while England is partial to strong bread, thus the Pacific coast wheat is the most popular in France, while England favors our northern wheat.

"Grain vessels going around Cape Horn cannot be loaded to over one-fourth bulk on account of damage from cargo shifting. Upon arrival across the water the grain is transferred into what is known as millers' sacks and is thence forwarded to mills throughout the country. The business on the coast is attended with much more risk than we are accustomed to take on this side of the Rockies. There is no way to hedge and dealers are expected to make charters months in advance, which of itself is most speculative; but let it be borne in mind that the next decade will see a wonderful growth west of the Rocky mountains, and with that growth the objectionable features of the grain trade on the Pacific coast will undoubtedly disappear. You may not have noticed it, but Greater New York alone has a population 300,000 greater than the combined population of our Pacific coast states. In 1891 Mr. C. Wood Davis of Kansas City, a man prominent as a statistician and who posed for many years as the farmers' friend, prophesied that this country would within five years be an importer rather than an exporter of wheat, and this opinion was concurred in by some of the larger grain dealers of the country at the time. I then stated in an interview that I felt the time for importing wheat into this country was exceedingly remote. I feel today as I felt then, and I believe the grain business in this country is still young. It was only last year that elevators were built in the extreme western part of Kansas and I think we will see the day when we will invade the state of Colorado. Do you comprehend the magnitude of the agricultural products of this country? It may surprise you to know that in 1895 the agricultural products of the state of Iowa alone exceeded in value the mineral output of the entire United States, including the coal production of Pennsylvania. Since then, however, the conditions have somewhat changed on account of the large gold discoveries in Colorado and Alaska.

"Many of you remember when Gen. Hazen made his unfavorable report to the government on the Northern Pacific railway project, stating the road as projected would traverse a barren desert; but much of that country is now dotted with the homes of prosperous farmers. This past season Gen. Washburn of Minneapolis has been opening up the country north of Bismarck—a country supposed to be absolutely worthless for agriculture. I have driven with him over his survey and from the observations I then made it appears that after getting 25 miles north of Bismarck the rain belt is struck and the country will undoubtedly prove to be most productive. My observation has been that the planting of trees and turning over of the sod attracts moisture. (I recall the time when the city of Sioux City paid a dollar a tree for each tree that was planted and lived two years.) I believe that what is now known as the Arid West will by artificial means be made an agricultural garden. I believe the canyons of Colorado will sooner or later be utilized as reservoirs, serving two purposes—confining the water in the spring and thus preventing the overflow of rivers, and later dealing it out as it is needed for irrigation purposes—and this work should be done by the government. Our association should exert its best influence, collectively and individually, at home and in Washington in the interest of irrigation by the government. The Snake river district alone if irrigated would produce millions of bushels of grain, and with our fast increasing population and the Orient absorbing an increasing quantity of our Pacific coast goods, we shall need more acres. We will find some good use for everything God has given us and we must tax our brains and energies to develop our endowment. Senator Warren of Wyoming in a recent address made the following statement:

WHERE FUTURE DEVELOPMENT WILL BE.

"'There now remains at the disposal of the general government unappropriated and unreserved land aggregating 900,000,000 acres; of this approximately 350,000,000 acres are in Alaska, and practically all of the remaining 550,000,000 acres are in that part of the United States west of the Missouri river, once known as the Great American Desert, now called the Arid West, and destined in time to be freed from this implied designation of inferiority. To aid commerce the general government since its establishment has dredged harbors, removed obstructions in channels, deepened river beds, built break waters and otherwise diverted and controlled waterways. The expected benefits of such aid cannot well be called local, for the territory to be subserved is as great in extent as the aggregate acreage of all the New England, Middle and Southern states and Ohio, Indiana, Illinois, Michigan and Iowa additional.'

"The railroads are the great civilizers and equalizers of the age and famine cannot exist at one end of this country with plenty at the other. Wheat has been shipped from Oregon to Texas; Kansas wheat has found lodgment in Minneapolis and Minneapolis wheat in Kansas. Nebraska corn shipped to Duluth has been reshipped to Kansas City, and at the present time potatoes are being transported from Oregon to Texas. These moves are made as conditions change, which changes are hourly watched and the opportunities improved by the grain merchant. The farmers get the greater benfit for the reason that competition is too keen or the opportunity is lost if one waits for more than a legitimate margin. I have occupied every position in the elevator business and speak from personal knowledge and experience. I know how hard it is for the country buyer to allow his competitor to take the bulk of the grain even when he knows that the party is losing money on every bushel. I know how unhappy the traveling man is, whose elevators rank second on the line. I know also that the cold, dry figures shown by the books in the main office constitute the keynote to the whole situation, for glory fades away at the end of the fiscal year if the balance is on the wrong side of the ledger. I am a believer in men and that the best way to get along in the world is to be absolutely frank, open and aboveboard with one's competitors. The man who misleads or indulges in half truths not only is soon found out, but belittles himself in his own estimation and thus gives the honest and candid man the advantage. Many a quarrel between buyers could be averted by openness and frankness. So far as line companies are concerned, I am quite positive that much trouble is brought about by the excess of zeal of our own men. We believe ourselves to be straightforward and honest, but we are prone to believe quickly anything bad that we hear about our neighbors. There is no class of men in commercial pursuits who are given so large a financial credit as the elevator men; they are the medium through which the great crops of the country are collected and forwarded to all parts of the world, and in shouldering the heavy responsibilities involved in the scientific carrying-on of this great trade they must of necessity have the confidence of the financial centers of the country. In the city of Minneapolis the great grain center of this whole country—a position she is more firmly establishing every year—no class of men stand higher morally, socially and financially than the elevator men and the confidence that is reposed in them as a class is based on the fact that they are known as non-speculators, confining themselves to the strictly legitimate business of dealing in grain, collecting it in small parcels and delivering it in large. I do not recall in all my long experience the case of a single elevator man who has ever failed in business except from two causes, speculation and mismanagement.

"I think many merchants place too much reliance upon the gossip they hear emanating from the various boards of trade. Much of the gossip circulating is written by men who are either long or short of the market, thus causing their judgment to be absolutely worthless; or, if not by men thus personally interested in the market then by incompetent sensationalists who are willing to tell you what to do but have never done anything themselves. These meetings are productive of very much good; they cannot be held too frequently. When we can have but one a year of the national organization let us have more than that of the state organization, and still more of the county organization, and have daily intercourse and exchange of ideas with our neighbors. Do not deceive yourself by believing that you know it all and your neighbor knows nothing. Do not deceive yourself by thinking that you have any advantages at terminal points that he does not also get. Do not make the mistake of imagining that you receive favors from the railroad company that your competitor does not also receive. The object of this meeting today is to absorb and impart, and it will not be a success if we fail to get some good out of it. In one sense we are competitors, but in real fact we are partners. An advantage gained by one of us is of short duration and usually reacts. We must be systematic and watchful of details to be able to handle our business at the minimum cost. We will become bankrupts if we aim to secure the profits per bushel that obtained ten years ago. We must shrink our margins as the volume of business increases. Our field is larger, our opportunities greater and our competition keener, and to be successful we must change with the conditions and accept them as they exist today."

NEPTUNE ANTI-FOULING COMPOUND.

The Engel & Fagersten Chemical Co., 1702 Wabash avenue, Chicago, evidently have in their Neptune anti-fouling compound an article that overcomes the difficulty of scale in boilers of steam vessels, as they have just sold 12,000 lbs. to the North German Lloyd Co. and they have letters of commendation from the United Fruit Co. and other well-known steamship concerns. The composition is especially suited to vessels using ocean water. Thorough tests were undertaken by the North German Lloyd company before this compound was adopted. The manufacturers publish a letter from Oelrichs & Co., New York agents of the North German Lloyd, showing that before it was applied to boilers of all steamers of that company it was tried gradually on seventeen different vessels, the experiments extending over a period of nearly a year. Chief Engineer R. Rose, now of the North German Lloyd steamer Friedrich der Grosse, makes to his company the following report of trial with this composition on the steamer Barbarossa:

"When using the preparation no furs or salt deposits were formed, but all inner surfaces of the boilers were covered with a very thin white coating and therefore the boiler plates were protected against rust and corroding. The trial was made with three-storied compound boilers (double boilers), of which each holds 38 tons (equal to 10,000 American gallons) of water and the preparation was applied as follows: After the boilers were filled with fresh water, 40 oz. or 2½ lbs., equal to 1¼ liter, was put into each one. During the running the loss of water in each boiler is daily about 5 tons (1,320 American gallons), therefore for three boilers 15 tons (3,960 American gallons.) The loss was largely replaced by fresh water, which is taken along in the double bottom (tanks) and at the same time there were put into each boiler daily in drops through the injecting pumps (Weirs' pumps) about 1-3 lb., equal to 1-6 liter of the preparation. The salt in the boiler water at the end of the trip amounted to 3 per cent. (equal to sea water) which was caused by defects in the condenser."

The manufacturers say that although the composition is somewhat higher in cost than others on the market, the small amount required makes the cost low—for ocean boilers, four ounces of compound for each thousand gallons of water fed into the boilers, and for fresh water boilers, from one to three ounces of compound for each 1,000 gallons of water fed into the boilers. The composition leaves a white translucent film on the inside of the boiler. This protects the iron from corrosion and prevents scale crystals from attaching themselves to the iron.

FROM SEABOARD SHIP YARDS.

VARIOUS ITEMS OF INTEREST REGARDING NEW ORDERS, LAUNCHES, TRIAL TRIPS, ETC.—LAUNCH OF SECOND PACIFIC MAIL LINER.

The launch of the Pacific mail liner Siberia at the works of the Newport News Ship Building & Dry Dock Co., Newport News, Va., last Saturday afternoon, was a notable event. With her sister Korea, launched a few months ago, she is the largest vessel so far constructed on the American continent. The Siberia is the sixth large vessel launched at Newport News during the past year, and will be followed two weeks hence by the new Morgan line steamship El Alba, which will ply between New York and New Orleans. The Siberia and Korea are to ply between San Francisco and Hong Kong. Each ship will cost, when completed, $2,000,000, and their dimensions are: Length, 572 ft. 4 in.; beam, 63 ft.; depth, 40 ft.; draught, 27 ft.; displacement, 18,600 tons. Accommodations are furnished for 200 first-class passengers and 1,200 Chinese in the steerage. The ships are designed for a sustained speed of 18 knots an hour, and it is expected that this speed will be exceeded for short periods. They are propelled by two four-cylinder, vertical-inverted, direct-acting, quadruple-expansion engines, designed to develop 18,000 I.H.P. on eighty-six revolutions a minute.

The W. & A. Fletcher Co., Hoboken, N. J., has contracted to build a twin-screw yacht, designed by J. Beaver Webb, for W. S. Spaulding and brother of Boston. In appearance the yacht will resemble J. Pierpont Morgan's Corsair, and will be of the following dimensions: Length over all, 200 ft.; length on water line, 162 ft.; beam, 24 ft. 6 in. The indicated horse power is to be 1,200, and the vessel will be equipped with triple-expansion engines and Yarrow water-tube boilers built for 225 lbs. of steam. The Fletcher company will also construct the Newark, the new ferryboat for the Pennsylvania railroad, which will be 206 ft. long, 65 ft. beam and 17 ft. draught. Thomas S. Marvel & Co., Newburg, N. Y., will doubtless build hulls for both vessels.

Work on the passenger steamers building for Norfolk-Richmond service of the Old Dominion Steamship Co. is progressing as rapidly as possible. It is expected that one will be launched from the yards of the Harlan & Hollingsworth Co., Wilmington, Del., about Oct. 25, and the other at the W. R. Trigg Co.'s yard, Richmond, Va., soon afterward.

W. W. Brauer, No. 15 Whitehall street, New York, representing a German line running steamers between Philadelphia and Hamburg, says that his company will build six new ships of 10,000 tons each, work to be begun within four months, for service between New York and Hamburg.

It is expected that the Central Railroad of New Jersey will build two 20-knot harbor fliers for the increasing trade between New York and Atlantic Highlands next summer. The new steamers will be expected to make the trip of 19½ miles in 55 minutes, 10 minutes faster than the time of the present steamers Sandy Hook and Monmouth.

Arthur D. Story has three wooden vessels on the stocks at his ship yard at Essex, Mass. At Tarr & James' yard two schooners are on the stocks and work will be immediately begun on another, while in Oxford Story's yard there are three craft on the stocks and two more to build.

The new stern-wheel steamer H. M. Carter, which was built for the Red River trade at Howard's yard, Jeffersonville, Ind., has made her trial trip and worked satisfactorily. The vessel is equipped with compound engines.

Two new Red Star line steamships, Finland and Kroonland, will be launched at Cramps, Philadelphia, in a few weeks. Each vessel is 580 ft. long, 70 ft. beam, 30 ft. depth of hold, with a gross tonnage of 12,000.

A four-masted wooden schooner, building by Capt. Warren Sawyer of Millbridge, Me., for Capt. George Tunnell of Philadelphia, will be launched Oct. 29.

Keel for the new armored cruiser Maryland will be laid at the yards of the Newport News Ship Building & Dry Dock Co., Newport News, Va., next week.

A three-masted wooden schooner, to be named Charles H. Klinck, will be launched from the works of Robert Palmer & Son, Noank, Conn., shortly.

Commissioners appointed by the government of Queen Wilhelmina of Holland are investigating the workings of the Holland submarine torpedo boat at Elizabeth, N. J., for the purpose of making a report to the Holland government as to the advisability of adding one or more such vessels to the navy of Holland. The commission consists of Admiral Tademe, chief of staff; Capt. Wurtholtz, chief of the bureau of torpedoes, and Sir Rappa, naval constructor.

Excursion rates to Florida via Baltimore & Ohio R. R. and Washington, D. C., passing through the beautiful cities of the south. Stop over privilege allowed on all round trip tickets. Two fast trains leave Cleveland daily at 3:00 and 11:20 p. m. Call at city ticket office, 241 Superior street. tf.

WANTED—Ship Draftsmen. A competitive examination will be held at the Washington Navy Yard, November 20, 1901, for the purpose of establishing an eligible register of ship draftsmen and assistant ship draftsmen. Pay of ship draftsmen ranges from $3.60 to $5.04 per diem; that of assistant ship draftsmen ranges from $2.00 to $3.28 per diem. For application and further information apply to Commandant, Navy Yard, Washington, D. C. Oct. 24.

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Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total.....	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

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TRADE NOTES.

Hon. William A. McAdoo, ex-secretary of the United States navy, has been chosen as counsel of the Steam Boiler Equipment Co. of New York, and also as director and vice-president to succeed the late millionaire manufacturer and inventor, Elliot P. Gleason.

Work is now under way upon the foundations for the large new plant of the B. F. Sturtevant Co. at Hyde Park, Mass. That the buildings can be completed none too soon for the urgent needs of the company is evidenced by the fact that their present plant at Jamaica Plain, Mass., is now taxed to the limit and that it has been necessary to run overtime, particularly in the engine and electrical departments.

The C. P. Goerz Optical Works, 52 East Union square, New York city, is now ready to fit its new plate attachment to the M. Eastman folding pocket kodak, so that both plates and films can be used where heretofore films alone could be used. The advantages of using a plate attachment of this description are that pictures can be focused on the ground glass and that all kinds of plates can be used, whereas there is only one kind of film made; also the saving of the cost of material, plates costing about one-half and being much easier to handle, the difference soon paying for the cost of the attachment.

A pamphlet, somewhat out of the usual order, has just been issued by the S. A. Woods Machine Co., South Boston, Mass., and is devoted to the "Woods" floor-board, boring, marking and measuring attachments. Of this machine it is said: It bores automatically for nails while flooring passes through the machine at any rate of speed; marks at the same time on under side of the piece name, initials or other distinguishing number; positive, accurate and automatic in action, not affected by possible variations in rate of feed; can be applied at time of construction of machine, or by anv ordinary mechanic afterwards, to planers and matchers of Woods make and some others. The pamphlet may be had upon application.

Mr. J. W. Duntley, president of the Chicago Pneumatic Tool Co., recently issued the following letter to customers of that company: "Referring to the circular letter of Mr. J. G. Timolat, recently sent you, announcing the decision of the United States circuit court in favor of the Moffet patent No. 369,120 on portable drilling machines, this company has, after consultation with leading patent attorneys and a careful examination, become convinced that the portable power drills it is making are infringements on said Moffett patent; and in order to protect its customers from litigation and further expense, has purchased a license under said patent, which protects all drills we have manufactured and sold or shall hereafter manufacture and sell. Trusting you will appreciate the prompt action we took in this matter to protect our customers against expense and inconvenience, we are, etc."

Some interesting reading matter relative to very shallow draft powerful steamboats for river navigation is mailed free on receipt of request by Marine Iron Works, station A, Chicago. 5

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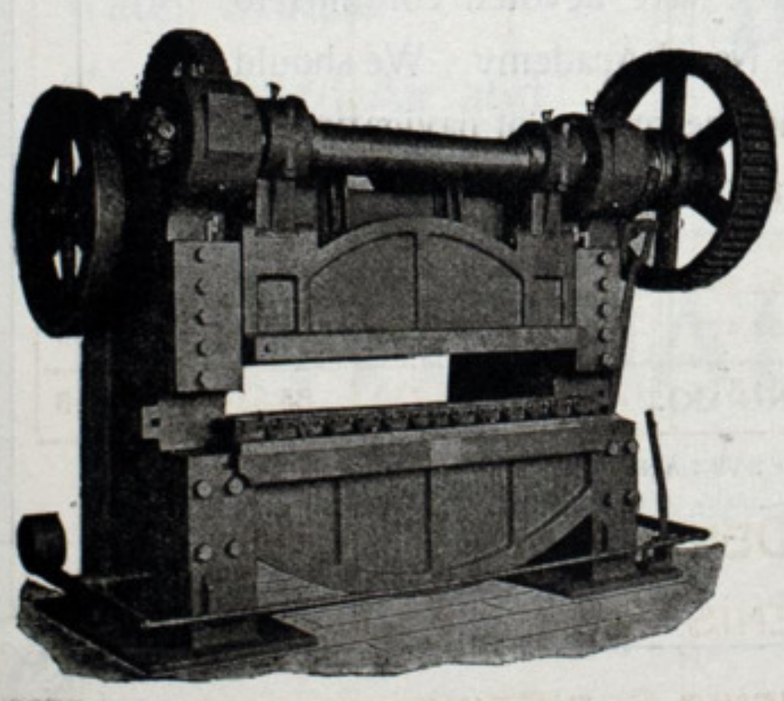

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But changes, wonderful to contemplate, have marked the last half century. The name of the great revolution was steam. Through its agency seamanship lost its old command. It became subordinate to the science of navigation. All existing volumes upon seamanship speedily became obsolete. But yesterday of unquestioned authority, today they are merely junk. Such is the moving panorama of the world's progress that its views appear, like opportunity, but once upon the scene and are gone. How appropriate, therefore, is its title "Modern Seamanship." It has to do with seamanship as it exists today, when every sea is charted, when even the rise and fall of the tides in every part of the world is computed by machinery, when hurricanes can hurl their awful force against the ocean liner—not to destroy but merely to check. "The hurricane reached its maximum at twelve and the Kronprinz Wilhelm checked down"—the dispatches will say. Checked down to what? To 19 knots. Twenty-five years ago there wasn't a steamship afloat that could make 19 knots in the smoothest sea that ever was sailed. This is the seamanship the book deals with. It embraces all, the old and the new, but its great virtue is that it is distinctly modern.

We are in the business of handling books, but when the printer sent us this product of his handiwork, we complimented him. It is a large book but it is superb to the least detail of its 428 pages, to which must be added 136 of the finest and clearest plates we have ever seen. No book has received more favorable notices. Even the daily press, usually as dumb as oysters when a technical volume appears, have devoted columns to it. It has been adopted as a text book at the United States Naval Academy. We should think that every person interested in modern seamanship, in the science of navigation, in the building, equipping and managing of a ship would want it. We shall be glad to send it to anyone. THE PRICE IS $6.

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IN ALL SIZES FROM 1/8 TO 16" DIAMETER.

Stay Tubes,
Water Grates,
Compressed Air and
High Steam Pressures.

Boiler Tubes
FOR ALL CLASSES
OF MARINE WORK.

Hollow Shafts,
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Hydraulic Tubes,
Etc., Etc.

NATIONAL TUBE COMPANY,

SELLING AGENTS,

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FOREIGN OFFICE:
Dock House, Billiter Street,
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Dearborn Vegetable Boiler Compounds.

SCIENTIFICALLY AND UNIFORMLY MADE. EVER RELIABLE.

Most Scientifically equipped, Complete, Handsome and expensively Furnished Laboratories, and the ONLY EXCLUSIVE LABORATORIES ON STEAM ECONOMY in the Country.

MARINE FORMULA NO. 5, For the WATERS of the FIVE LAKES.

To prevent pitting, neutralize the oil, stop incrustation, and as a perfect preservative to the iron, boiler, and all its connections—especially prepared for the marine trade of the lakes.

If you are using a different water, prepay the express on a gallon jug of your feed water to the DEARBORN LABORATORIES at CHICAGO and receive a copy of analysis of same, with a written diagnosis of your case, and a letter giving you all the valuable information we can, and the actual cost of what it will require to clean your boilers and keep them clean. All of this will be done free of charge, and optional with you whether you order or not. When in Chicago call and inspect our Laboratories.

Analyzers of Everything.

Makers of Boiler Compounds.

DEARBORN DRUG & CHEMICAL WORKS

WM. H. EDGAR, President.

Manufacturing and Analytical Chemists.

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OFFICES: 29, 30, 31, 32 and 33 Rialto Building. Telephone, Harrison, 1373. WORKS: 23, 25, 27 and 29 La Salle Street. Telephone No. 1130 South.

The BLISS TAFFRAIL LOG

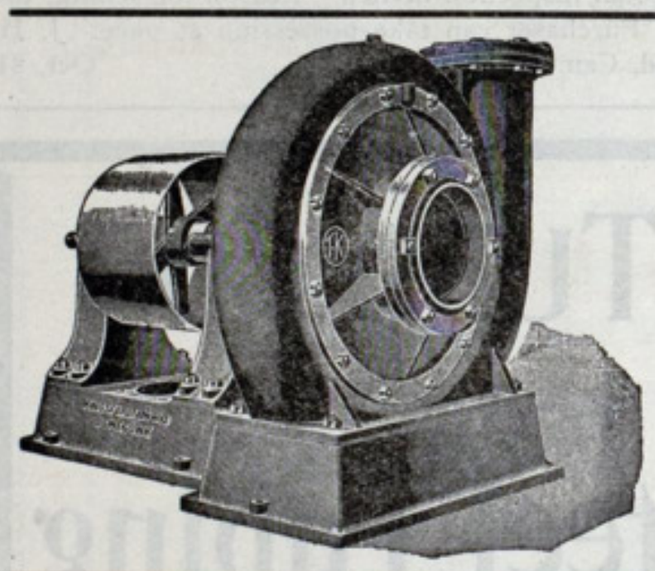
Over 11,000 Sold

A portion are now made to indicate Statute Miles for use on the Lakes.

Send us your old Bliss Register, and we will alter it to indicate statute miles for $3.50.

There are poorly made imitations of our rotator. Buy only the Bliss Adjustable Rotator, stamped with our name and patents. For sale by Ship Chandlers.

John Bliss & Co., 128 Front Street, NEW YORK.



DREDGING, WRECKING, CIRCULATING AND BALLAST PUMPS.

Marine Boilers.

KINGSFORD FOUNDRY AND MACHINE WORKS,

OSWEGO, N. Y.

ALL MATERIAL MANUFACTURED FROM OUR OWN IRON

WE HAVE OUR OWN GALVANIZING PLANT

NEWHALL CHAIN FORGE AND IRON CO.

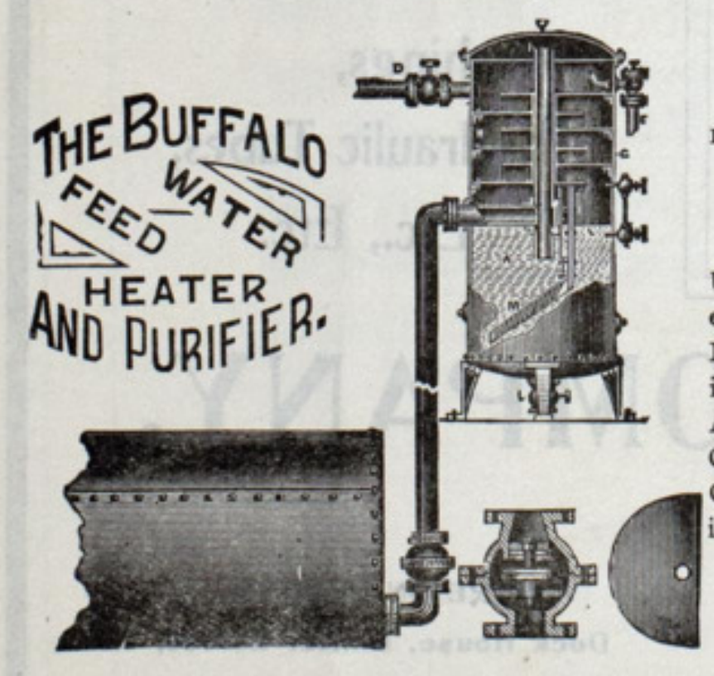
OFFICES, HAVEMEYER BUILDING 26 CORTLANDT STREET NEW YORK

"WARWICK" SHIP DRIVING IRON, SPECIAL HEAD MACHINE AND HAND MADE SHIP SPIKES, CLINCH RINGS, SCREW BOLTS, RODS, TURNBUCKLES, PLAIN AND BABBITTED CHOCKS AND CLEATS.

DAVITS, SHACKLES, SWIVELS AND OTHER FORGINGS. CLOSE LINK AND STUD LINK YACHT AND SHIP CABLES, ANCHORS, BLOCKS, BUNKER PLATES, CAPSTANS, WINDLASSES & PUMPS.

KEEP YOUR BOILERS CLEAN BY USING Clean Water

The "BUFFALO" is Warranted to Remove all Sediment and Scale Forming Substance.



Anyone Can Operate It.

IT ADDS YEARS TO THE LIFE OF THE BOILER.

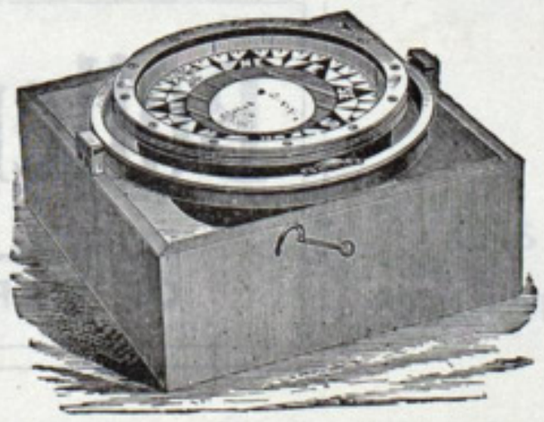
Used on principal steamers of Anchor Line, Lake Michigan & Lake Superior Transportation Co., American Steel & Wire Co., Bessemer Steamship Co., and others, aggregating 55,560 I. H. P.

Ask For Catalogue.

ROBERT LEARMONTH, Patentee,

100 WHITE BUILDING. BUFFALO, N. Y.

Ritchie Liquid Compass



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USED EXCLUSIVELY BY THE UNITED STATES NAVY FOR OVER 35 YEARS.

OVER 25,000 USED IN MERCHANT SERVICE.

Made in all sizes and styles, from 2 to 12 inches diameter of card. All compasses made by us have our name printed below the North point, or prominently upon the card. NONE OTHER ARE GENUINE. Latest form with four or six needles, the best instrument for iron ships. For sale by ship chandlers and nautical instrument dealers.

CATALOGUE FREE.

E. S. RITCHIE & SONS,

Manufacturers of Nautical and Physical Apparatus,

BROOKLINE MASS. U. S. A.

Absolute extinction of fires in holds or bunkers of ships no matter what the cargo.

Machine installed weighs 3800 lbs.

THE CLAYTON FIRE EXTINGUISHING AND DISINFECTING COMPANY
11 BROADWAY, NEW YORK.

C&B LINE

Pan-American Route

between **CLEVELAND** and **BUFFALO.**

STEAMERS CITY OF BUFFALO AND CITY OF ERIE.

Finest and fastest passenger steamers in the United States.

TIME CARD—DAILY—APRIL 15 TO DEC. 1.

Leave Cleveland 8 p. m. Arrive Buffalo 6.30 a. m.
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ADDITIONAL SERVICE DURING JULY AND AUGUST.

Connections made at Buffalo with trains for all Eastern and Canadian points; at Cleveland for Detroit and all points West and Southwest.

SPECIAL LOW RATES CLEVELAND TO BUFFALO AND NIAGARA FALLS EVERY SATURDAY NIGHT, ALSO BUFFALO TO CLEVELAND.

W. F. HERMAN, General Passenger Agent, Cleveland, O.

GEORGE STRATFORD OAKUM CO.,

MANUFACTURERS OF

Oakum, Plumbers' Spun and Marine Oakum and Spun Cotton.

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ONE OF THESE BINDERS

that will hold 52 NUMBERS of the

MARINE REVIEW,

Will be mailed to any address on receipt of $1.

MARINE REVIEW...

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Pintsch Gas Lighted Buoys

Adopted by the English, German, French, Russian, Italian, and United States Light House Departments, for Channel and Harbor Lighting; over 1000 gas buoys and gas beacons in service.

Burn Continuously

from 80 to 365 days and nights without attention, and can be seen a distance of six miles.

Brilliant and Steady Illumination.

Economical and Reliable in Operation.

Controlled by the **SAFETY CAR HEATING AND LIGHTING CO.,**
160 Broadway, New York City.

HIGH CLASS STEAM YACHTS, MARINE ENGINES,

Seabury's Water Tube Boilers,

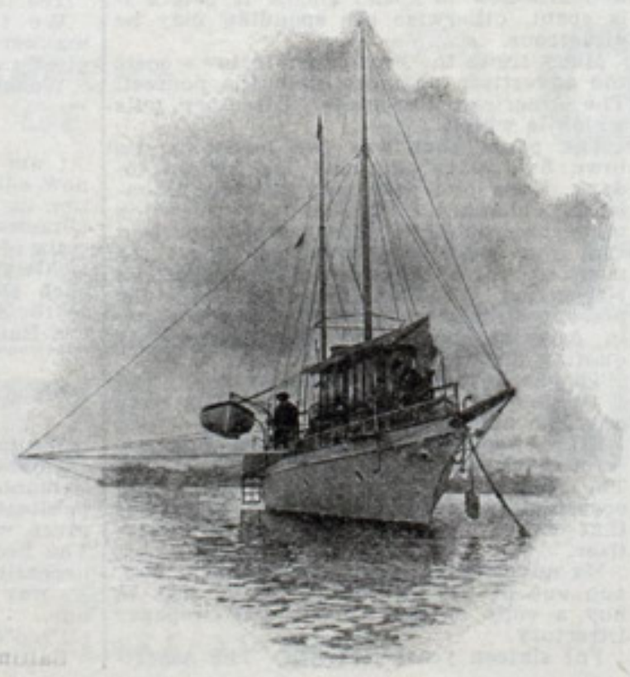
AND

THE ONLY

NAPHTHA LAUNCH,

GAS ENGINE & POWER CO.

AND



CHARLES L. SEABURY & CO., Consolidated,
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Send 10c. stamp for catalogue.

FOGG'S RESILIENT FELT MATTRESSES AND CUSHIONS

MANUFACTURED BY

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20 Fulton St., NEW YORK.

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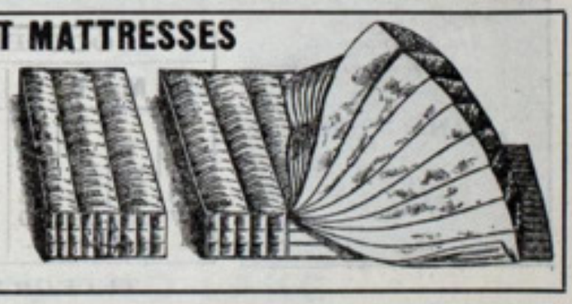
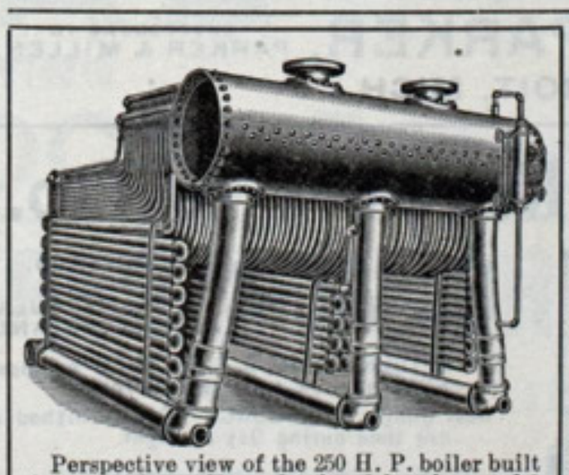




Perspective view of the 250 H. P. boiler built for steamboat Clara, having 6 feet face and 8 feet length; 37 7/12 square feet of grate area and 1900 square feet heating surface. Weight of boiler and water, 14,000 lbs.

WE CLAIM for the Boyer Sectional Water Tube Boilers, that they are of an entirely new design, are simplest in construction, are accessible to all parts, are rapid steamers with short circulation, have low center of gravity, have no joints in the fire, have no dead ends, occupy less space in width, length and height than any other, are easily fired, can be repaired or set up by any ordinary mechanic, do not require a brick casing, and are shipped whole or knocked down into packages for transportation by man or beast.

The Boyer Water Tube Boiler Co.,

90 Wall Street, NEW YORK.

MENTION THIS PAPER.)

The W. L. SCOTT COMPANY, ERIE, PA.

WHOLESALE DEALER IN

SHAMOKIN ANTHRACITE WILKESBARRE **COALS** YOUGHIOGHENY PITTSBURG MANSFIELD

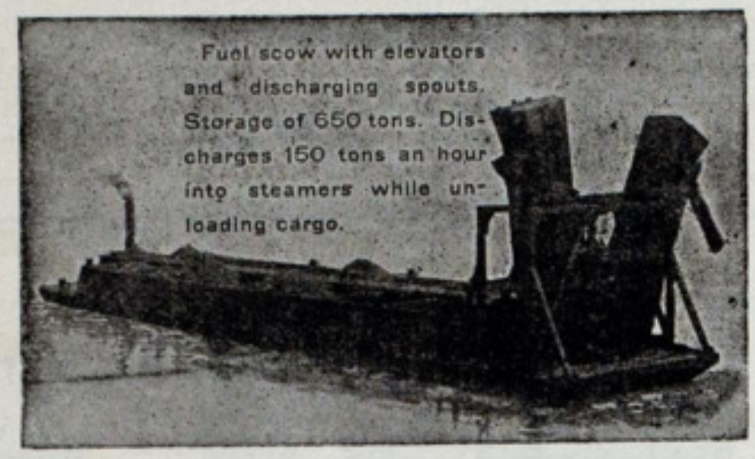
VESSEL FUELING A SPECIALTY By STEAM LIGHTER or Car Dump at all hours. Electric Light.

Main Office, Scott Block, Long Distance Telephone No. 440.
Fueling Office, Canal Dock, Long Distance Telephone No. 320.

Steamboat Fuel at Ashtabula. LARGE SUPPLIES OF BEST QUALITY

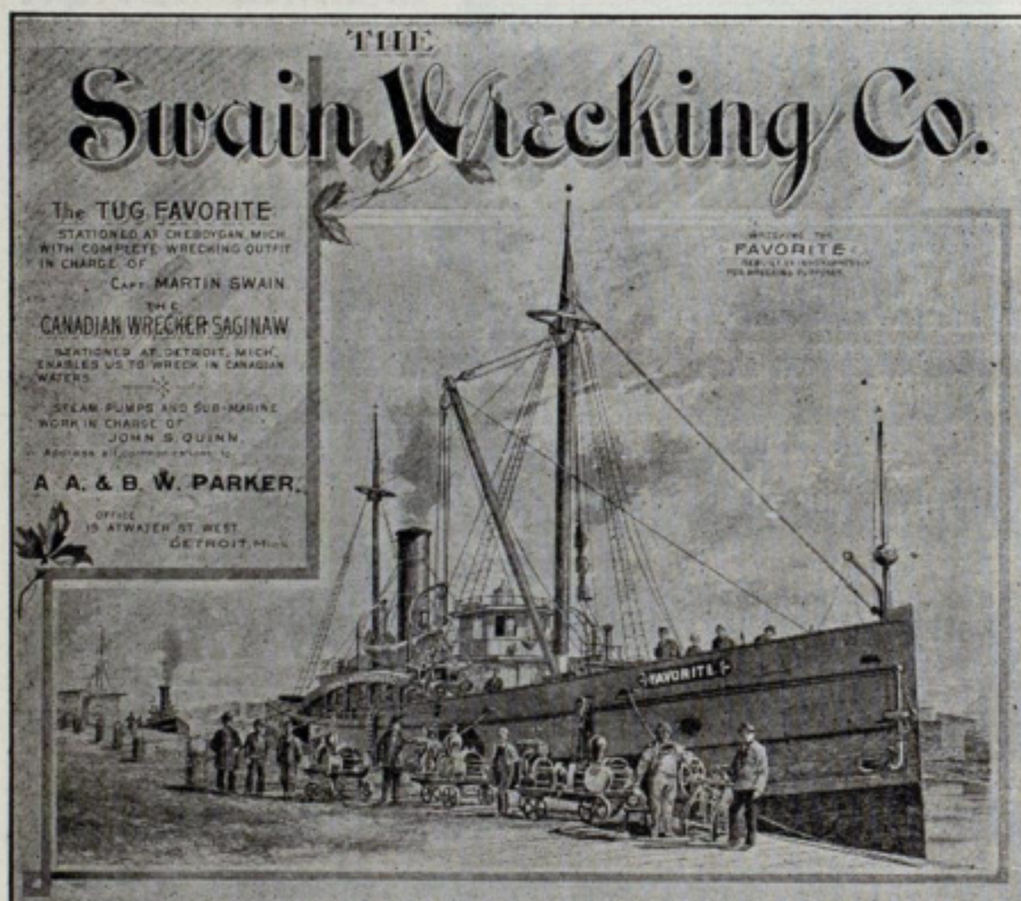
Lighter

Carrying Different Grades at all Times.



M. A. HANNA & CO., **Miners and Shippers.** Main Office, Perry-Payne Bldg., Cleveland

THE
Swain Wrecking Co.



4 STEAM PUMPS, 10 JACKS, 3 HAWSERS.

1 COAL and ORE PUMP
3-12 INCH ROTARY
1-14 INCH WORTHINGTON

DIVING RIGS AND DIVERS ABOARD AT ALL TIMES

OCTOBER.						
S	M	T	W	T	F	S
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6	7	8	9	10	11	12
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10-100 TON JACKS
1-12 INCH HAWSER
1-10
1-9

Telegraph
Capt. M. SWAIN,
CHEBOYGAN, MICH.

TELEGRAPH.

A. A. & B. W. PARKER, SUCCESSORS TO PARKER & MILLEN,
DETROIT, MICH.

Pickands, Mather & Co.,

FUEL LIGHTERS AT BUFFALO, ERIE, ASHTABULA AND CLEVELAND.

AT DETOUR MICH., A FUEL DOCK equipped with Shute capacity of 600 Tons.

Best Quality PITTSBURGH COAL furnished at any time during Day or Night.

Western Reserve Building, CLEVELAND, O.

American Newspaper Directory.

Tells the circulations of all American newspapers. Revised, corrected and reissued every three months. Sixteen hundred pages: Price Five Dollars a volume or $20 a year.

BUFFALO.

We should hardly know how to get along without the American Newspaper Directory. We regard it by all odds the most complete and reliable guide that the advertiser can make use of; in fact, we use no other.

Buffalo, N. Y., July 24, 1901.
R. V. Pierce, M. D.,
President World's Dis. Med. Ass'n.

VERMONT.

The American Newspaper Directory stands, as it has always stood, the first and best of newspaper directories—the only one which cannot be ignored, the only one which every advertiser must have. No other can take its place; no other is needed—Joseph Auld, in the Burlington (Vt.) News of July 3, 1896.

ADVISOR.

The Advisor accepts the American Newspaper Directory as the standard in newspaper ratings. The obstacles which obstruct its efforts to get true and reliable information are many.

* * * *

The directory question is one which interests every publisher in the country—nay, the entire world. But in the United States directories are becoming altogether too numerous. In this, as with other books of reference, it is necessary to have one which may be relied on as being an authority on the matter of newspaper circulations. There can be no question about the fact that at this time, as for many years past, the American Newspaper Directory is that authority. The Advisor is not paid to make this announcement. It makes the statement in the interests of advertisers and publishers because it is true. One thing the advertiser is almost cock-sure of when he refers to the American Newspaper Directory is that the circulation figures he sees therein are not overstated to any great extent. In most other directories they are. Only the publisher himself is to be blamed for not securing a proper rating in that publication, and every advertiser of consequence knows it. Thus the publisher who refuses to furnish a statement places himself under a reasonable suspicion.—The Advisor for June.

New York, June, 1901.

CHICAGO.

Messrs. Geo. P. Rowell & Co.'s American Newspaper Directory has long since earned the reputation of being the best of its character. It contains the results of patient, expensive and systematic effort to secure all attainable information of interest concerning American newspapers. The work has been honestly done. This will not be questioned by any unprejudiced examiner. The most important question is circulation. In attempting to give this information the editor of the Directory encounters his most difficult work. It is the aim and necessity of the Directory to give the truth. The American Newspaper Directory is to-day the dependence and guide, in a greater or less degree, of every large advertiser in the country.—Chicago (Ill.) Daily News.

BATES.

The American Newspaper Directory is the only reliable guide for the advertiser.

No man who advertises can afford to do without it.

What Bradstreet and Dun are to the mercantile world the American Newspaper Directory is to the world of periodical publications.

A new advertiser will get from the American Newspaper Directory a better idea of the greatness of his country, and the tremendous possibilities in newspaper advertising, than from any other source.

If an advertiser spends only $100 a year he should have the American Newspaper Directory. For his business may grow and his right expenditure of his money become increasingly important. The time to learn how to spend $10,000 is before it is spent, otherwise the spending may be disastrous.

Many times the best paper in town costs the advertiser no more than the poorest. The American Newspaper Directory tells which is which.

The paper that was the leader in its town five years ago may lag behind today. Even one year may witness astonishing changes. If you are spending money for publicity it is vastly important that you should know where to get the most of it for the price. The American Newspaper Directory gives not only the present circulation rating of every paper in America, but shows their history by quoting past ratings.

The book costs five dollars a copy, and a single reference to it may readily save or make many times its cost.

All newspaper directories but one are erroneously optimistic about circulations. The American Newspaper Directory may occasionally err on the other side, but that makes it all the safer for the advertiser.

My advertising experience began in 1885, and one of the first things I did was to buy a copy of the American Newspaper Directory.

For sixteen years Rowell's "The American Newspaper Directory" has had a place of honor and usefulness on my desk.

Many a publisher is ready to prove by other directories that "Rowell's is wrong," but few indeed can be induced to prove it by opening their circulation books to the advertiser.

Among publishers who are not willing that their real circulations be known it is the best hated book in print. The moral is not far to find.

Charles Austin Bates.
New York, June 24, 1901.

PABST.

If the improvement of the American Newspaper Directory continues in the future as it has during the past twenty years I do not think I shall live long enough to see any other directory take its place. There will, however, be the usual crop of directories, just as every other good thing is imitated. Your long years of experience in dealing with evasive circulation reports have most admirably fitted you for placing a proper valuation upon such statements. Advertisers have come to know that the Rowell estimates are nearer the proper figure than can otherwise be obtained. The American Newspaper Directory is therefore indispensable in every well regulated advertising department. Lines are being more tightly drawn every day; it is difficult to collect for twenty thousand when you print only eight. If the advertiser were buying barley he would not accept three pecks for a bushel, although the quality might at all times be open for discussion.

The American Newspaper Directory is the guide and companion of the advertising man, and it is to the interests of all concerned to help perfect it, support it and hurrah for it.

Pabst Brewing Co.,
J. R. Kathrens, Adv. Mgr.
Milwaukee, Wis., June 7, 1901.

SAPOLIO.

A growing need created it—the advertising agency system. One of the earliest and most successful workers, Geo. P. Rowell, is still in the field. He originated methods. Others followed. A first early step in advance was his publication of a list of all the papers—the American Newspaper Directory. He has never ceased to love it, and labor for it. Soon, out of the gross stupidity of imitation, it became a rule that every agency down to those of Oshkosh or Oklahoma must issue its own directory. An awful waste, for not more than one out of ten was worth shelf room. If the National Association of Advertising Agents could agree long enough to buy Mr. Rowell's Directory, publish it officially and drop all the others, it would accomplish something.

Artemas Ward,
Advertising Manager for Sapolio.
—In Fame, March, 1901.

WASHINGTON.

Every page of the American Newspaper Directory breathes the desire of its publishers that it shall be absolutely correct in every statement it makes.

Truly yours, Frank Roe Batcheld,
Clerk of the Committee on Banking and Currency, House of Representatives, U. S.
Washington, D. C., Jan. 17, 1899.

SOUTHERN.

We subscribe to and pay cash for the American Newspaper Directory, and find it of great value in our advertising department. We have 6,892 miles of railway, extending from Washington, D. C., all over the South, and in advertising this system we use more than 1,000 publications, and in selecting this list we find that we get a correct idea of circulation from this Directory that can not be obtained from any other similar publication. We receive other newspaper directories gratis; but the fact that we pay cash for this one in addition shows that we can not place the same dependence upon the "free list."

We thoroughly appreciate the careful manner in which this Directory is compiled.

Washington, D. C., Sept. 13, 1900.
Jos. H. Hannen,
Adv. Dept. Southern Railway.

I am looking forward to receiving the new edition with a great deal of anticipation as, although the American Newspaper Directory seemed to have reached a high state of perfection several years ago, there is always something new and of value in each succeeding edition. It is regarded as the standard authority with the Southern Railway.

S. H. Hardwick,
General Passenger Agent.
Washington, D. C., May 21, 1901.

BALTIMORE.

We have used the American Newspaper Directory for many years and find it more valuable to us than any other similar publication. Much of the information given we cannot obtain in any other way. The book is not only a great help but a necessity to our business, and we think its way of stating circulations is the ideal one. A. C. Meyer & Co.,
Prop'rs of Dr. Bull's Cough Syrup, etc.
Baltimore, July 31, 1901.

Five Dollars a Volume or $20 per annum. Sent, carriage paid, on receipt of price. Address

GEORGE P. ROWELL & CO., Publishers American Newspaper Directory, **10 Spruce St., New York.**

CASTNER, CURRAN & BULLITT,

SOLE AGENTS FOR

POCAHONTAS SMOKELESS SEMI-BITUMINOUS COAL

THE BEST STEAM COAL IN THE WORLD.

Officially endorsed by Great Britain and United States. Standard Fuel of United States Navy.
Used exclusively on Cunard, White Star and other Transatlantic Lines.

Main Office, 328 Chestnut Street - - PHILADELPHIA PA.

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1 Broadway, New York. Old Colony Building, Chicago, Ills. Terry Building, Roanoke, Virginia.
Citizens Bank Building, Norfolk, Va. 70 Kilby Street, Boston, Mass. Neave Building, Cincinnati, Ohio.
Calle Reconquista 399, Buenos Ayres, Argentine Republic, South America. 4 Fenchurch Avenue, London, England.

PITTSBURG COAL CO.

Steamboat Fueling Facilities at various points on the Great Lakes:

Cleveland Harbor — 4 Car Dumpers. 3 Lighters.	Fairport Harbor — 1 Car Dumper. 1 Lighter.	Ashtabula Harbor — 1 Car Dumper. 1 Lighter.	Erie Harbor — 1 Car Dumper. Fuel Pockets.
Detroit River Branch — Docks and Pockets at Sandwich and Amherstburg.	Sault River Branches — Dock and Pockets at Detour. Dock and Pockets at Sault Ste. Marie. (The Port Royal Dock Co.)		

WE FURNISH ONLY THE BEST GRADE OF **PITTSBURG and YOUGHIOGHENY COAL.**

General Office, Lake Department, Perry-Payne Building, Cleveland, O.

STEAMBOAT FUEL AT CHICAGO.

THE Y&L

Youghiogheny and Lehigh Coal Co.

J. T. CONNERY, Manager. ARCHIE J. HITCHCOCK, Dock Sup't.

FUEL DOCKS: No. 1, Michigan Slip & Basin. 'Phone Main 1650.
No. 2, N. Halsted St. Bridge. 'Phone Main 1649.
No. 3, Foot South Water St. and Illinois Central Slip C. 'Phone Main 1679.

FUEL LIGHTER: Equipped with 125 2-ton Buckets for Fueling Anywhere in Harbor.

MAIN OFFICE: 1238-1242 Chicago Stock Exchange Building.

Long Distance Telephone, Main 1650. 110 LA SALLE STREET.

The Rochester & Pittsburgh Coal & Iron Co.

REYNOLDSVILLE COAL.

STEAMBOAT FUEL DOCK—Blackwell Canal at Michigan St. Bridge. 1400 feet of dock frontage. Hulett Car Dumping Machine. Steam Fuel Scow of 550 tons capacity. Boats coaled day or night.

OFFICE: 684-88 Ellicott Square, BUFFALO, N. Y

TELEPHONE, Seneca 1154.

E. McQ. DUTHIE, Cargo and Fuel Agent.

STANLEY B. SMITH & CO.

DETROIT, MICH.

SHIPPERS OF **COAL** BY RAIL AND LAKE

OPERATING

SMITH'S COAL DOCK, Detroit River.

A COMPLETE SET OF CHARTS OF THE GREAT LAKES

LAKE SUPERIOR.	DETROIT RIVER.
LAKE MICHIGAN.	ST. CLAIR RIVER.
LAKE HURON.	LAKE ST. CLAIR.
LAKE ERIE.	STRAITS OF MACKINAC.

ST. MARY'S RIVER IN THREE PARTS.

ELEVEN IN ALL

SENT TO ANY ADDRESS, CARRIAGE PREPAID, FOR

$5.45.

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JOHN MITCHELL.
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Long Distance Telephone, Harrison 1586. CHICAGO.

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G. W. MAYTHAM.

202 Main Street,
Telephone Seneca 1660. BUFFALO, N. Y.

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Steamship Offices,

For Selling, Chartering and Building all classes Steam Vessels.
Steam Vessel Circulars.
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Suite 618 New York Life Building,
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STOWE & GRAYDON,
Lawyers and Proctors in Admiralty.

WILLIAM E. STOWE.
THOMAS J. GRAYDON.

204 Dearborn Street,
Suite 806 Marquette Building.
Telephone Central 1225. CHICAGO

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CLEVELAND, O.

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Williamson Building, CLEVELAND, O.

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LAW OFFICES,

HARVEY D. GOULDER.
S. H. HOLDING.
FRANK S. MASTEN.

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Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.
Crane Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.
Electro-Dynamic Co.....Philadelphia.
Gaskin, Edward.....Buffalo.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
Roelker, H. B.....New York.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.
Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.
Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Reynolds, H. J.....Cleveland.
Smith, W. Blackburn.....Perth Amboy, N. J.

FIRE EXTINGUISHING APPARATUS.
Clayton Fire Extinguishing & Disinfecting Co.New York.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FOG SIGNALS.
Colt Co., J. B.....New York.
Hamilton-Foster Fog Signal Co.....New York.

FORGES.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Scott Co., The W. L.....Erie, Pa.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Lake Shore Engine Works.....Marquette, Mich.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.
Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.
Bement, Miles & Co.....Philadelphia.
Watson-Stillman Co., The.....New York.
Wood & Co., R. D.....Philadelphia.

ICE MACHINERY.
Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Son, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.
Lein, Irvine & Co.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Boston Blower Co.....Hyde Park, Mass.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Toch Bros.....New York.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roelker, H. B.....New York.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REFRIGERATING MACHINERY.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

R. I. W. DAMP RESISTING PAINT.
Toch Bros.....New York.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SOUNDING APPARATUS.
Farr, C. W.....Chicago.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
Algoma Central Co.....Sault Ste. Marie, Ont.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Dominion Line .....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.
Colt Co. J. B.....New York.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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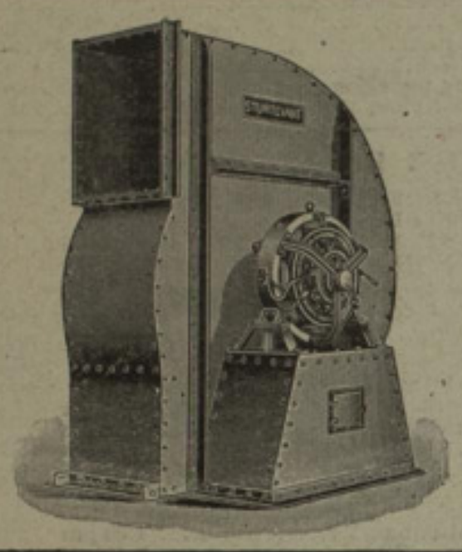

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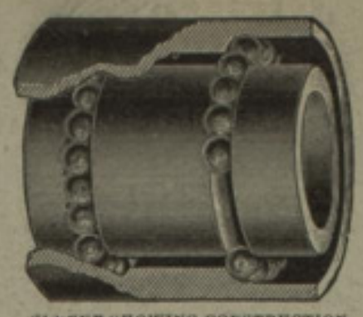

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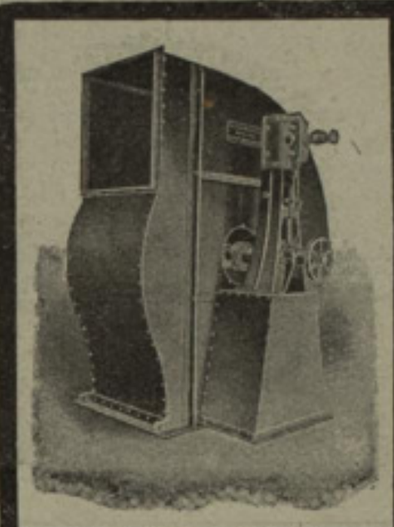

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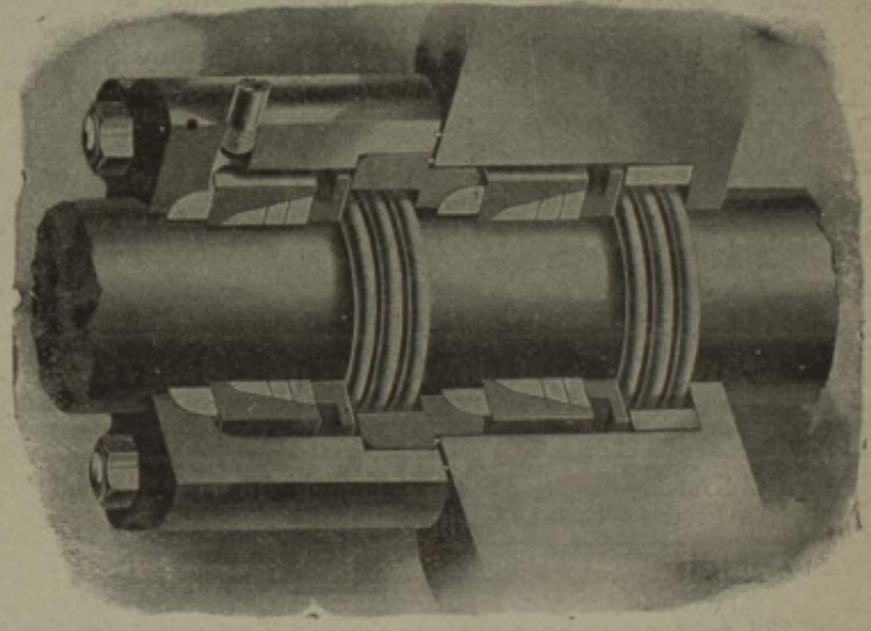

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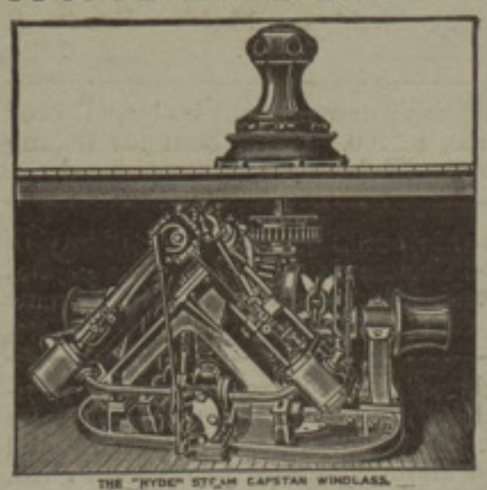

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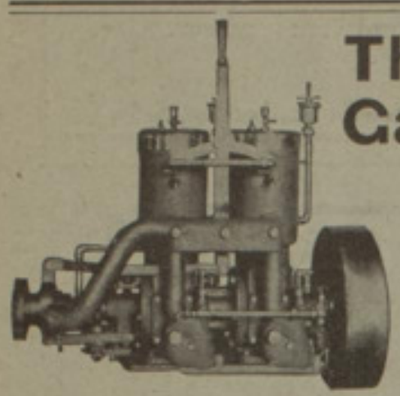

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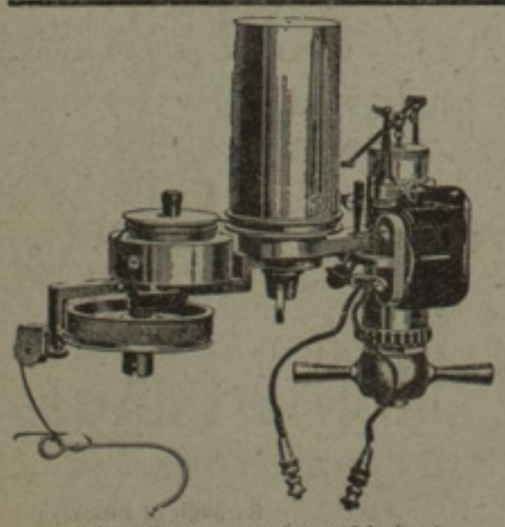

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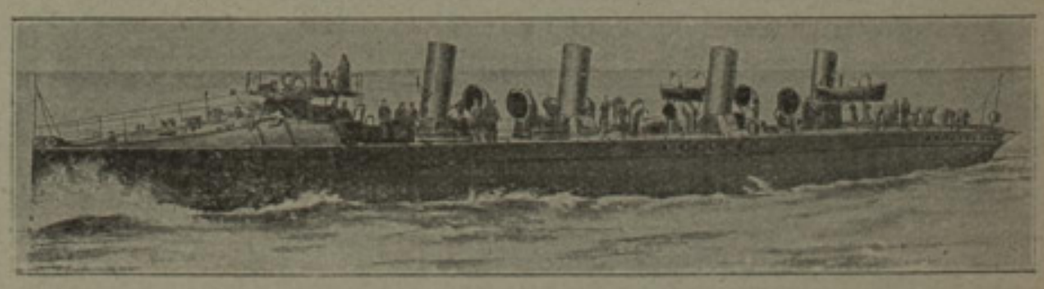

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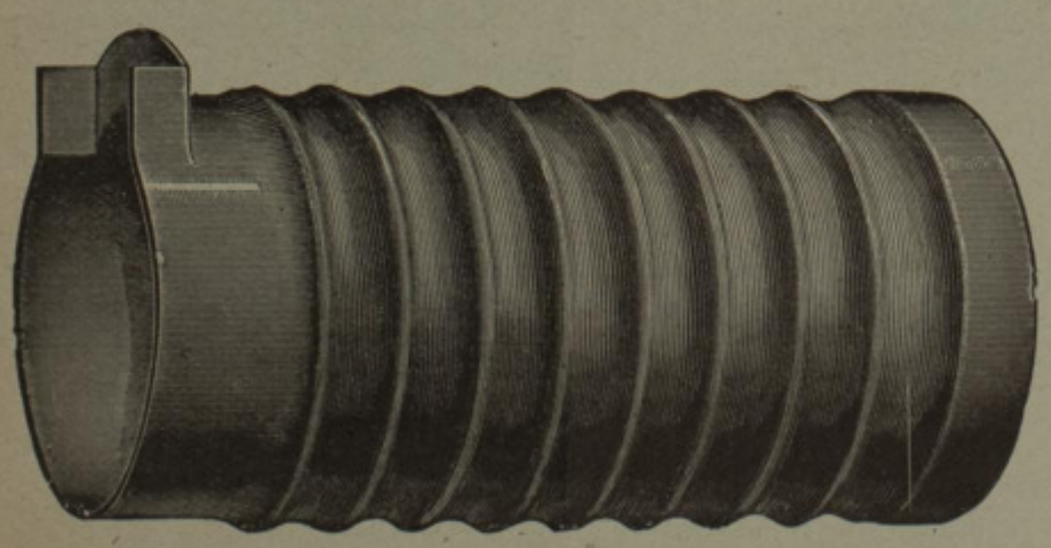

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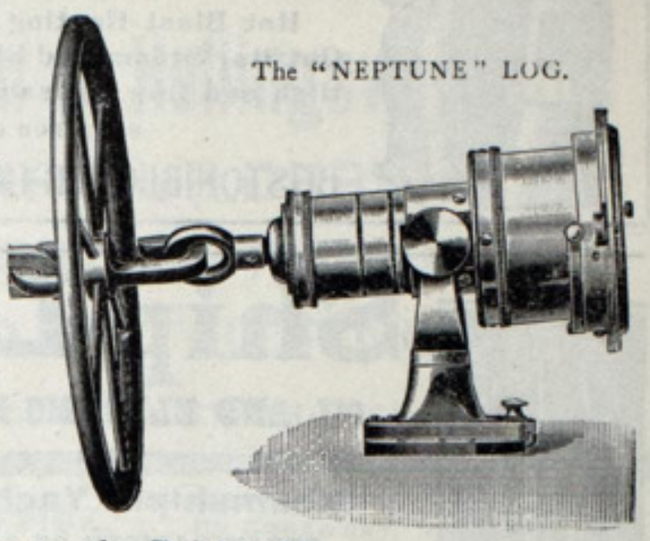

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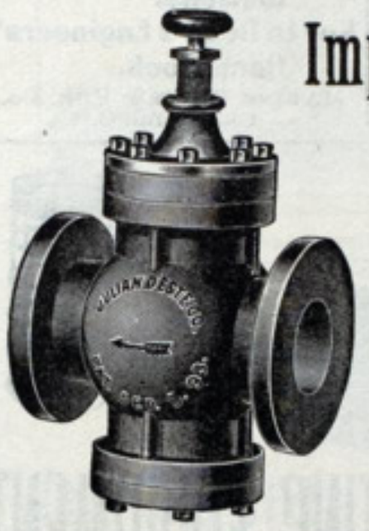

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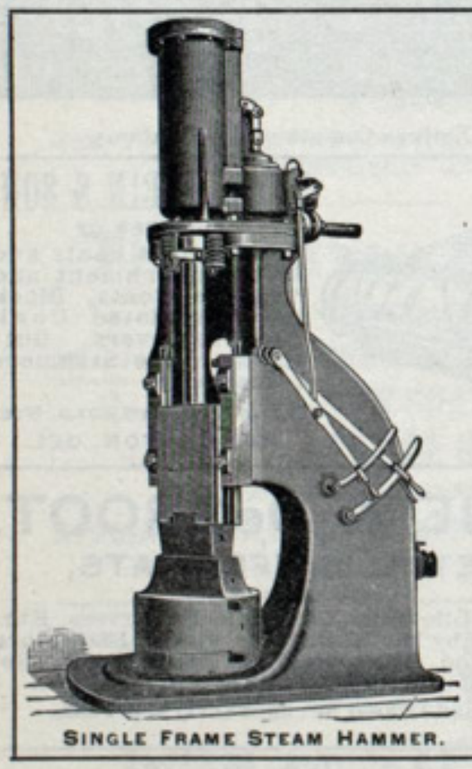

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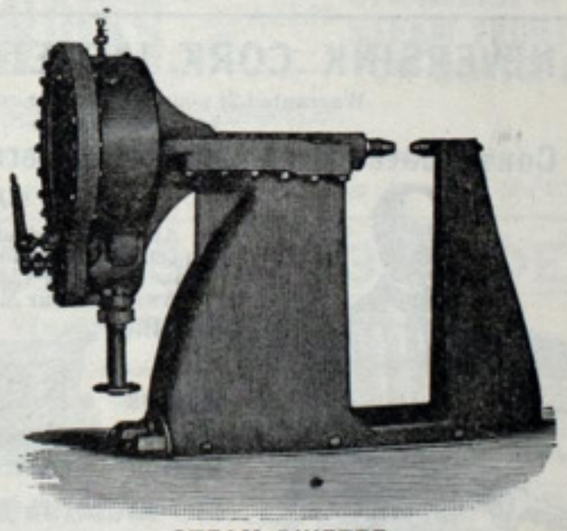

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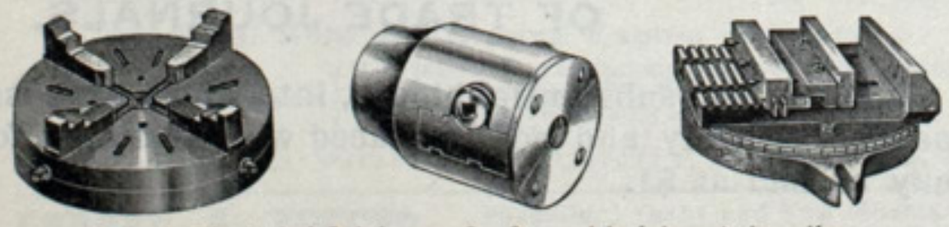

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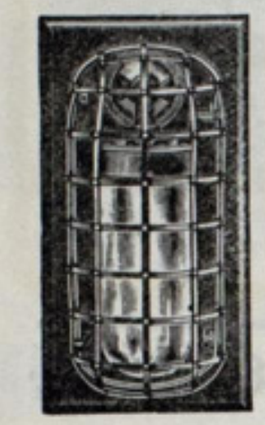

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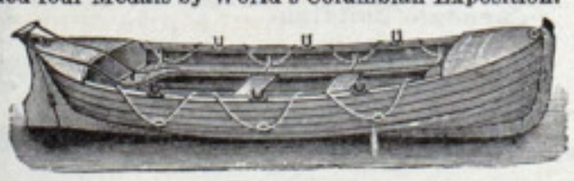

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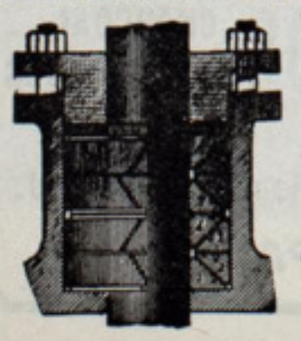

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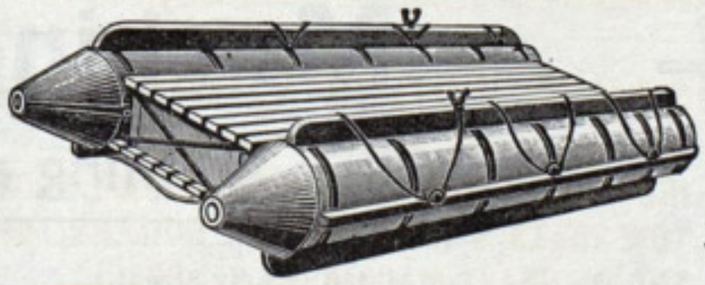

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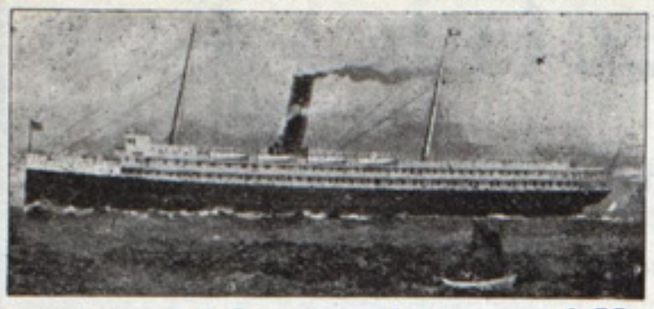

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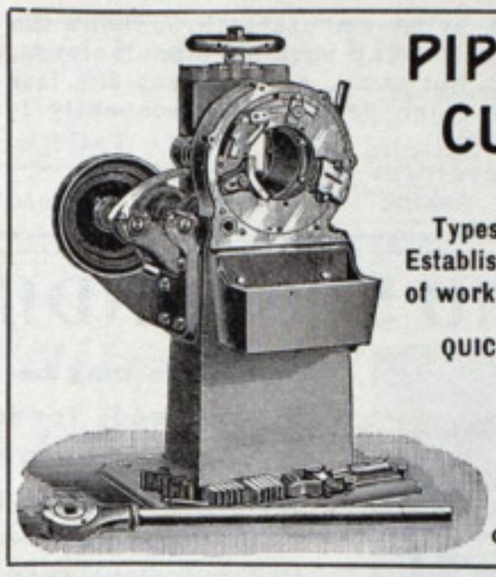

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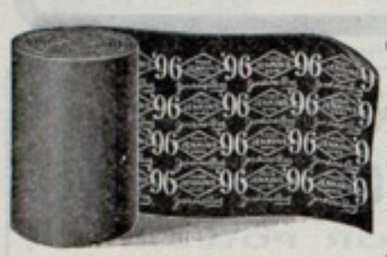

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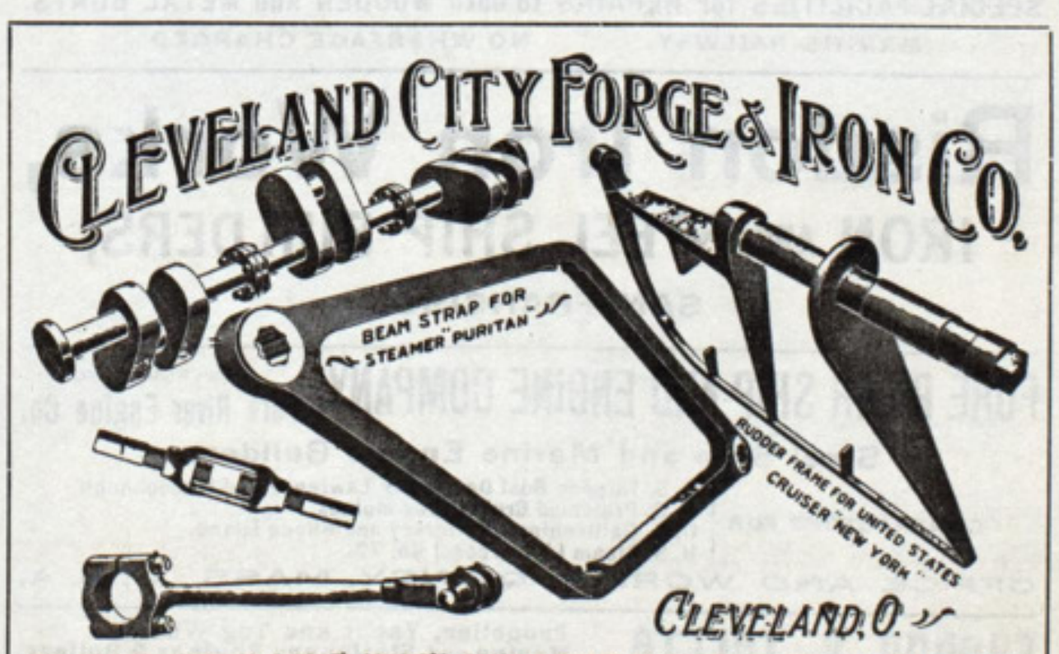

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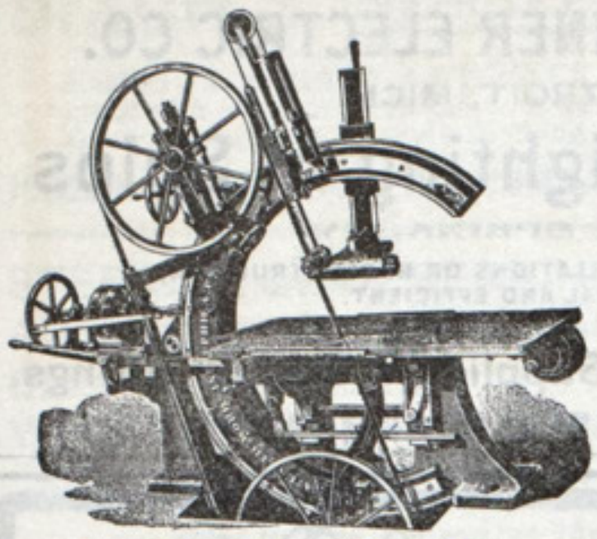

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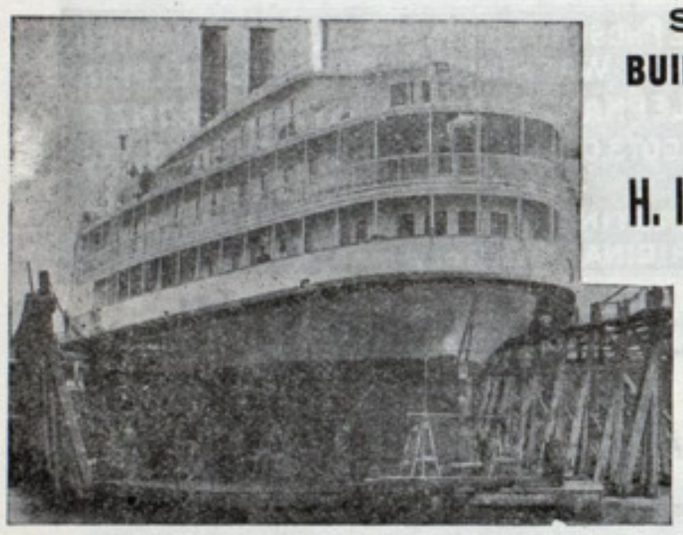

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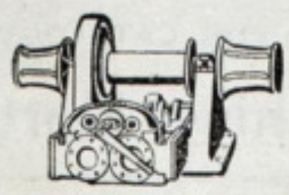

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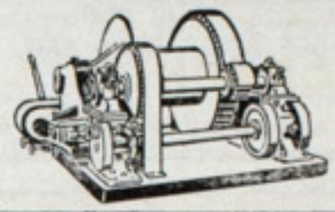

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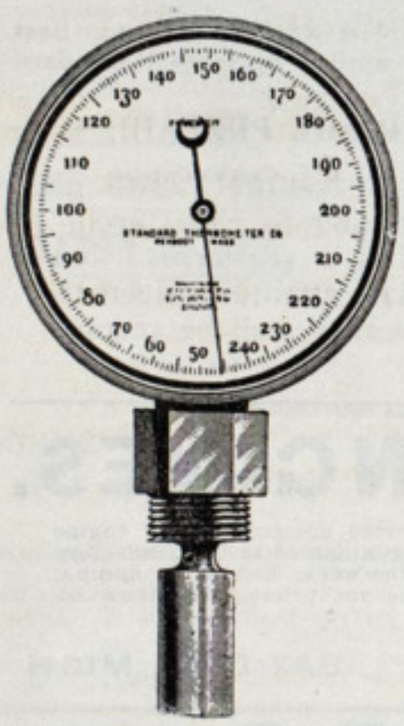

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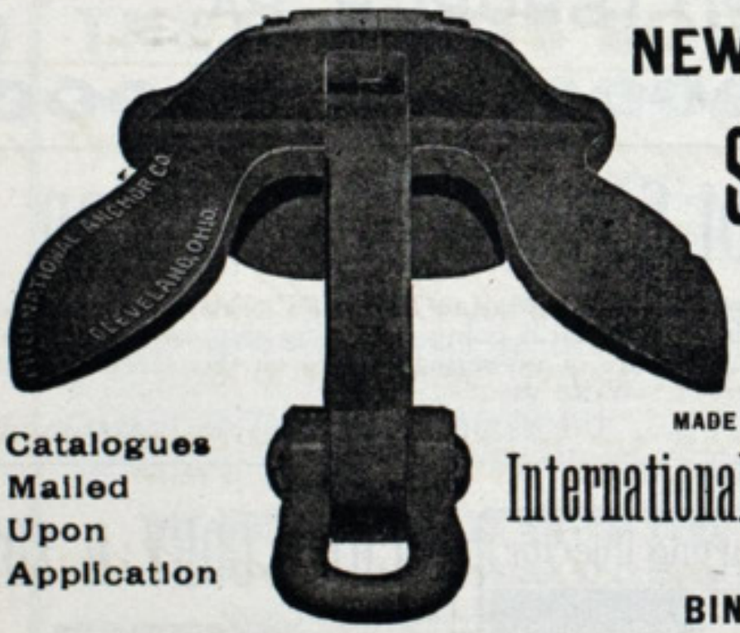

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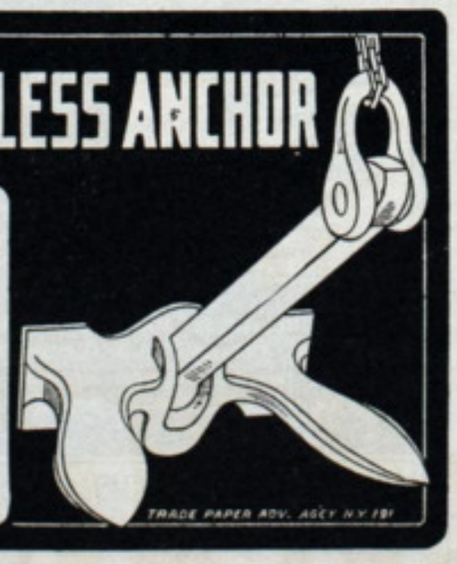

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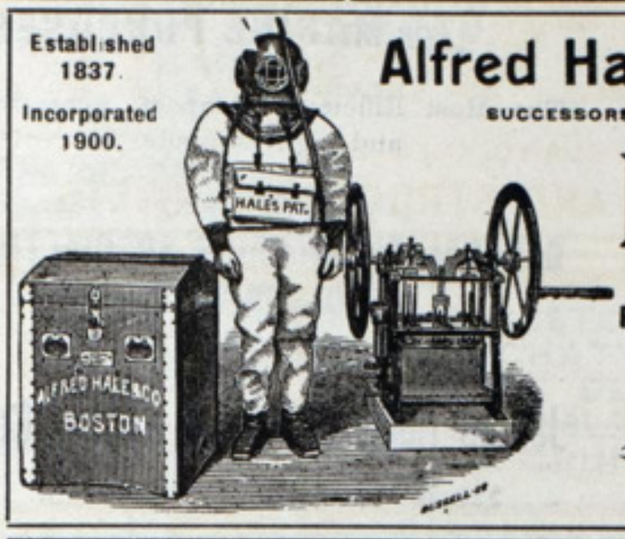

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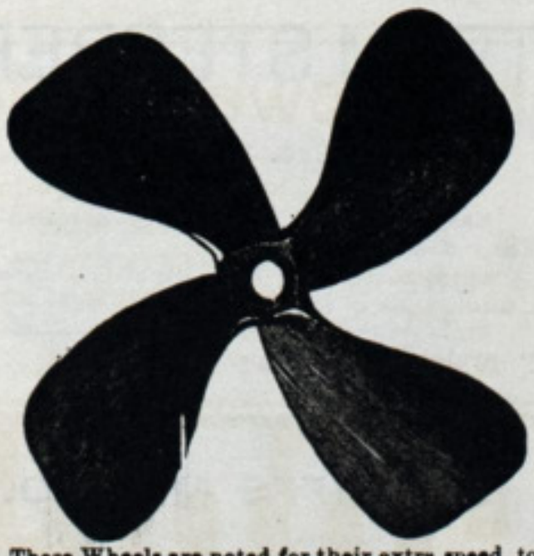

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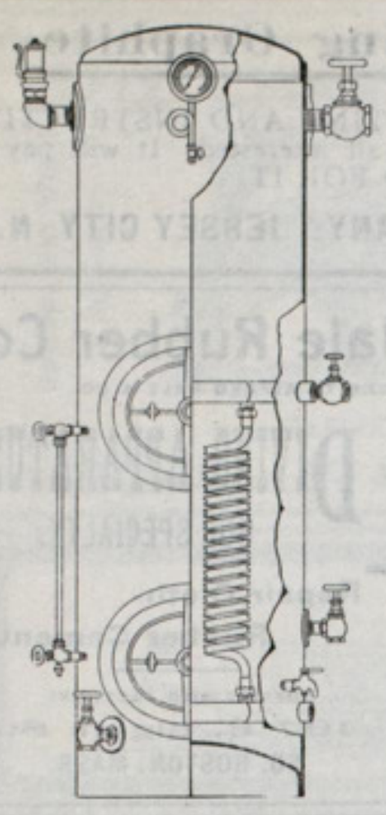

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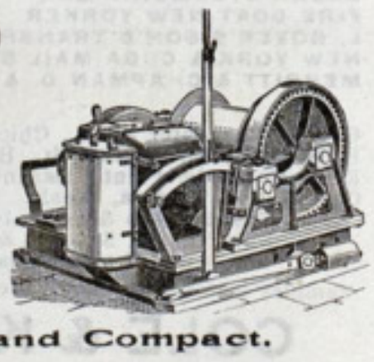

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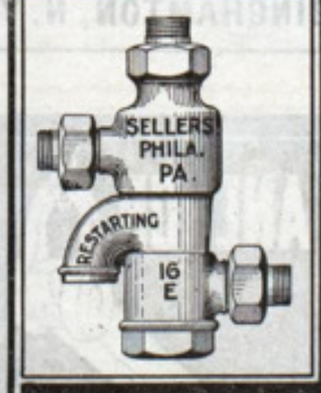

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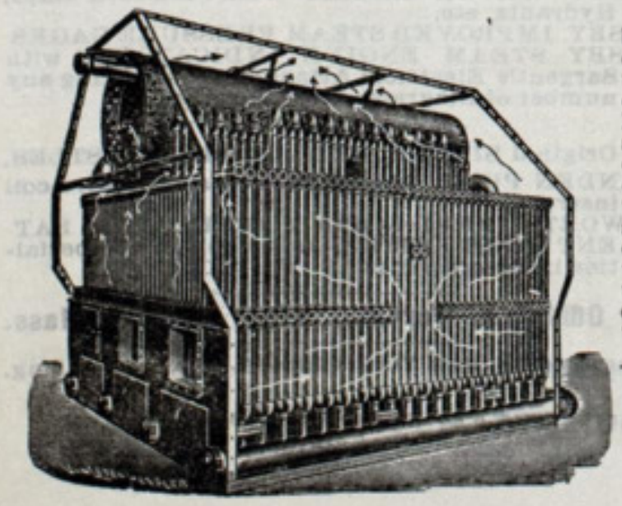

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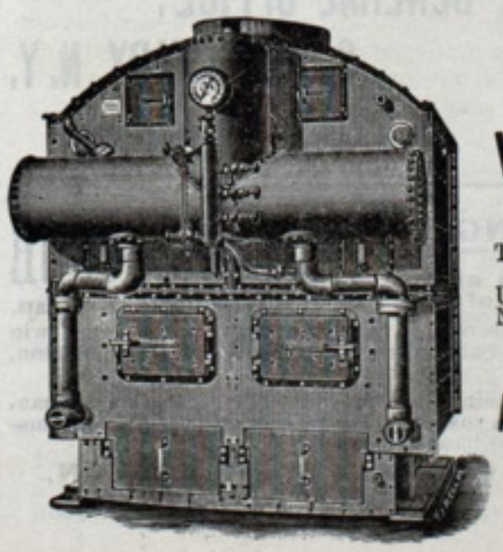

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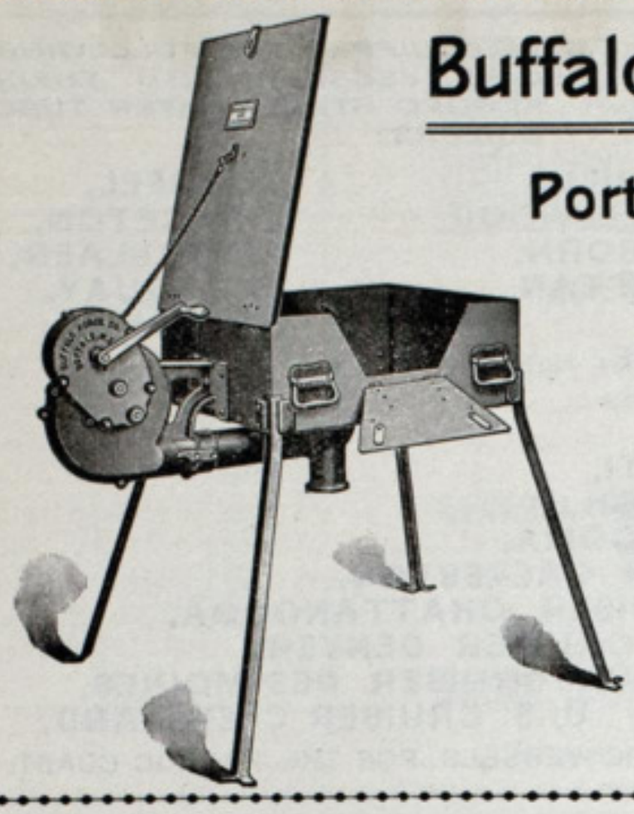

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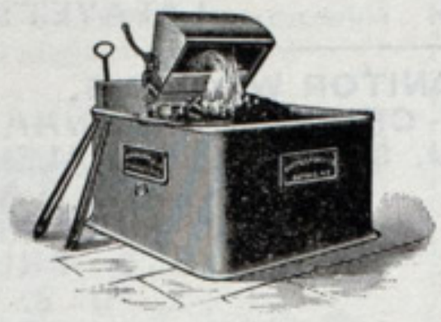

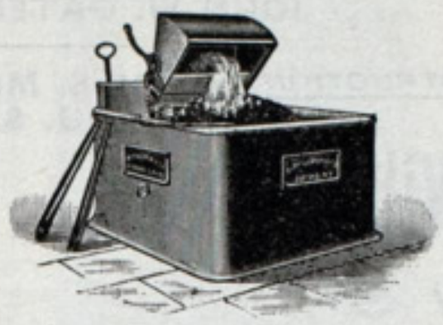

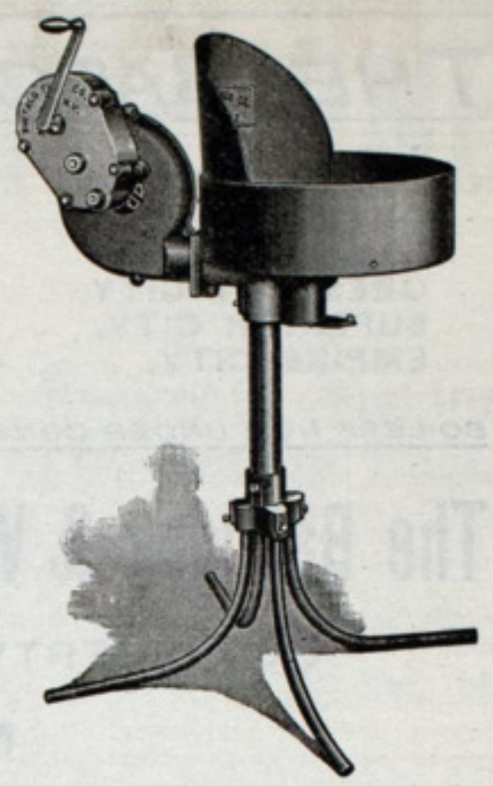

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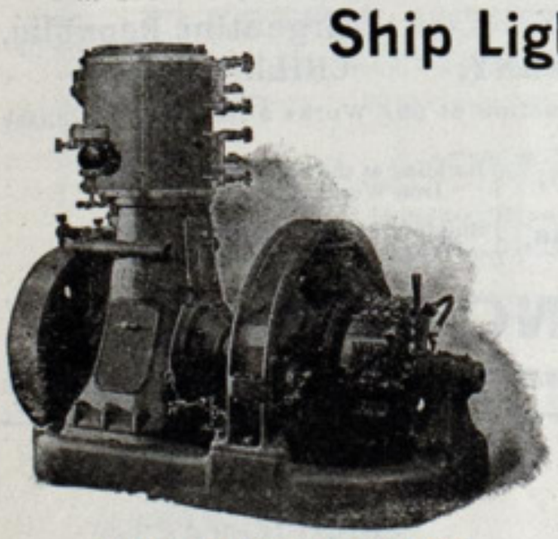

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